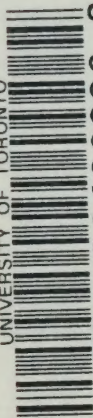



UNIVERSITY OF TORONTO



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PREFACE

This book is intended for the student of Drawing as well as for the teacher. Its object is to intensify a desire for a deeper study of this fascinating subject.

Although it is impossible to present a full treatment of the subject in the space at our disposal, we have endeavoured to briefly outline the full course expected to be covered by an average Public School student. We have endeavoured also to treat the subject in a practical way and according to sound psychological principles.

It is fully illustrated with fac-similes of pen and ink drawings by the author. These are presented for the purpose of fully illustrating the text rather than to present copy. The student should draw much for himself, encourage personal effort, learn to do by doing, using the illustrations for the purpose of reference and comparison.

For convenient classification and to facilitate the proper development of the course outlined we have divided the book into four parts :

- Part I. Freehand and Practical Design ;
- Part II. Mechanical Drawing and Illustration ;
- Part III. Object Drawing.
- Part IV. Applied Perspective, Grouping, Shade and Shadow.

We desire to acknowledge our obligations for valuable suggestions to Mr. Alex. McQueen, Principal of Victoria Public School, and to the Assistants of Colborne Street Public School.

We desire also to acknowledge very valuable assistance and criticism from Mr. R. M. Graham, Principal of the Model School, whose characteristics as a successful student of child nature are well known.

S. J. LATTA.

LONDON, February, 1900.

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INTRODUCTION

A proper understanding of the process by which the knowledge of an object grows in the mind is an aid to success in following the proper method of developing the study of drawing.

When we look at an object an image appears in the mind as soon as we cease to look at it. We think of two things: (1) The image in the mind; (2) The object outside of the mind that gave rise to this image.

Examinations of the drawings of children who have not previously had any acquaintance with the object drawn will help to estimate in how far this mental image corresponds with the original object that gave rise to it. We have found that although they show the influence of ability to represent the image by means of a drawing, the drawing will vary according to the ability to receive and interpret impressions received through the sense of sight. Our experiments, and we are open to criticism, have led us to conclude that the drawing is accurate only so far as the image in the mind is accurate.

On the other hand, if an object with which children are already acquainted is placed before them and they are asked to draw it, the result is quite different. We held before a class, in the first grade, an ordinary inflated foot-ball rubber and received something like the following facts concerning it: That it was round, soft, brown, provided with a thing through which to blow the wind, and that this thing was tied with a piece of string. After this discussion a drawing was requested, the object being still before the class. Some at first hesitated, and took a long look at the object; some moved their heads to one side and tried to see the "thing to blow the wind through" which by the way was kept carefully

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out of sight ; others went to work at once. Out of about thirty-five pupils over thirty made drawings like these :

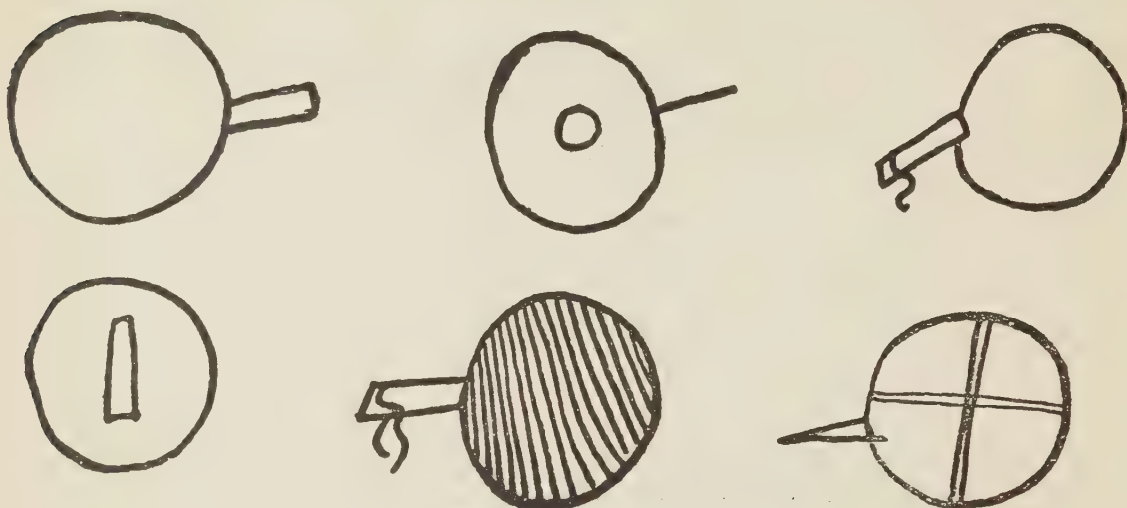


Fig. 1

We then put away the rubber and a short conversation took place about men and horses. The class was again requested to draw, but this time a man riding a horse. The great majority went immediately to work with great glee, exhibiting a decided air of "that's easy." The result was invariably something like these :

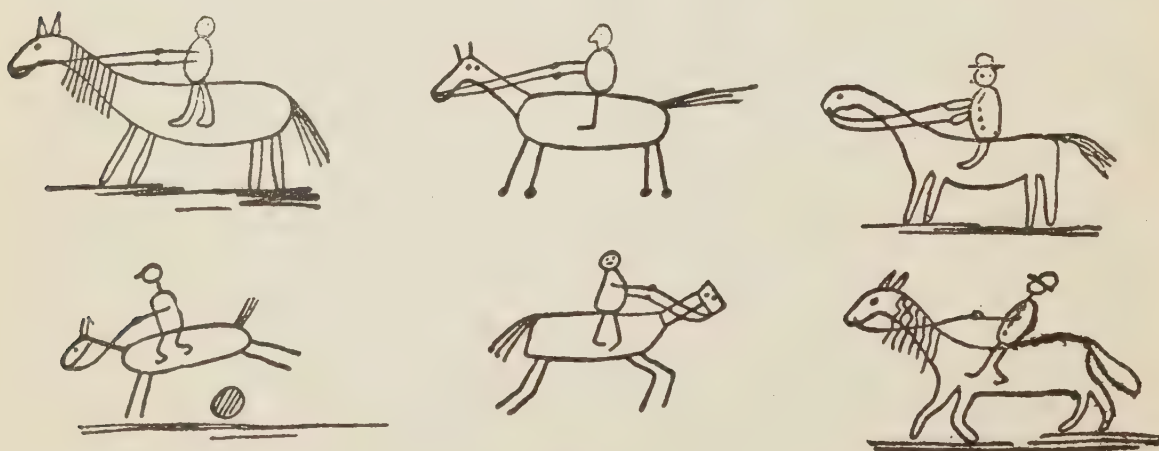


Fig. 2

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In the first case the previous knowledge of the object overcame the power to perceive it as it appeared, and in the second the object was immediately referred to what we choose to term conventional drawings either designed by themselves or given to them by some one else.

The result of these experiments undoubtedly proves that the principal elements that constitute the chief source of error in drawing are : (1) a previous knowledge of the object and (2) the possession of a conventional image of it.

Without extended discussion we desire to outline briefly a few hints resulting from our experience.

1. At the beginning avoid the drawing of objects of which a conventional representation has been learned.

2. Avoid too, at first, the drawing of an object in a familiar position. This familiarity may be the result of frequently seeing it thus or a picture of it.

3. Do not practice the copying of drawings, except as a means of becoming acquainted with good methods of representation. Even here there is a tendency for the copy to become so impressed as to interfere materially with actual mental images formed by contemplating the object itself, thus preventing attention to special characteristics not suggested in this particular drawing. This danger may be partially overcome by copying drawings of the same object in different positions.

We do not mean to say that a knowledge of the object to be represented is not necessary. Great speakers are great speakers not only because they have attained great power in the word method of expression, but because in addition to this they possess a clear understanding of the subject in hand. The eye reveals to us surfaces only. Rooper says, "A baby stretches out its hand for the moon ; how is it that what seems so near to him looks so far from us? Because in our case the impressions conveyed by the eye are supplemented by the impressions received through the touch, and the two distinct sets of impressions combined together in the mind furnish us with a conception of a third dimension, besides length and breadth—viz., depth. The child who has not yet got so far as to have sufficiently often united the impressions derived from looking with those derived from touching and moving, cannot rightly interpret the impressions which he receives. The moon seems quite close to him." The process of assimilation then, if care is not constantly exercised, misleads, and familiarity with an object may, as we have said, interfere with the actual observation of it. To overcome this difficulty we have advocated the drawing not only from objects, but from the same object in many different positions. Follow this plan as closely as possible ; the proper result will follow and you will be benefited by the process.

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Objects coming before the eye are reflected upon the retina from which the image is conveyed through the optic nerve to the brain, the seat of the understanding. The longer the object remains or the oftener it is presented to the vision the more perfect is the impression it leaves, and the more familiar its form becomes. This faculty of perceiving, or the power of the mind to receive and interpret impressions, may be cultivated and strengthened—educated by proper exercise properly directed. If an object remains before the mind long enough to make the impression strong, it becomes associated with the feeling and the will comes into play. We determine to remember the impressions thus received, and to this end the mind seeks to compare the new with the old, rejecting the unlike and retaining the like, until finally the new impression finds a place in the mind.

A child, for example, has seen cubical blocks. A trunk is presented. The irregularities of the trunk present new impressions and he says it is not cubical. Had there been no irregularity the trunk and the blocks would have coincided, but the difference causes an obstruction. True, the new and the old coincide to a certain extent. They do not however, coincide exactly. The old impressions, say length, breadth and height—the like elements, being firmly established, strengthen each other and unite to form a clear image. The unlike, smoothness and irregularity, become gradually obscured, till finally the two are recognized as one in the mind and he says the trunk is cubical. The classification and study of objects according to what are commonly termed type forms is the proper method, beginning with sticks and proceeding to the tablet, then the solid.

William James, Professor of Philosophy at Harvard University, in his talks on Psychology says: “No reception without reaction, no impression without correlative expression.” An impression that flows in at the eyes is incomplete and fails to produce the proper effect upon the memory. The most durable impressions are those on account of which we act. You notice for example, that when a circular tablet is held in an oblique position it appears as an ellipse. This impression as we have said is incomplete and will fail to produce the proper effect upon the memory unless there is reaction. You may say that it appears as an ellipse and still the conception corresponding to this verbal reaction may be inaccurate; but if the tablet is *drawn* as it actually appears, there is no room for ambiguity. This expression comes back again in the form of a further impression of what you have done. News of your having acted is received and you see the success or failure of your conduct. This return impression is the completion of the whole experience. The many illustrations that follow will, after you have done your best, by comparing your efforts with ours, better enable you to judge the result of your having acted.

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The sense of sight is accurate enough, but the perception of the whole object is a mental act; the judgment of what is seen is made in the mind. This power to judge, drawing seeks to develop. An apple for example, is presented. Impressions come crowding in upon the mind to such an extent that it is impossible to fix attention upon any one of them. The impressions made by the characteristics of roundness, smoothness, color, etc., are so massed and grouped together as to form an indefinite, unanalyzed whole; but after some concentration this indefinite whole is analyzed, broken up into its constituent elements. Certain of these stand out more prominently and consequently arrest attention, thus forming a foundation upon which the understanding of others is built. In this manner the indefinite mass becomes simplified and brought within the circle of the mind. In representing an object the boundary of the whole should first be defined. The definition may be only mental, but as we have before intimated the impression will be more complete if expressed by an outline. The characteristics of detail should be expressed next, beginning with the most prominent. Just here, again, care must be exercised to avoid the common error of exaggerating those characteristics which absorb the most mental activity.

Some are gifted with a peculiar aptitude for this method of expression—drawing. In such cases intuitive effort results in the rendering of truth in many respects, but at the same time a close scrutiny of the work done will reveal many imperfections which might be avoided if the underlying principles governing such expression were understood. Genius and talent may be widely different, yet in the rough they are slightly so. Knowledge will discover the latent powers of both and cause each to develop to the fullest extent. Knowledge of the principles of drawing we say is absolutely necessary in order that the best results may follow.

The mechanical work apart from its practical value will develop the proper use of tools and encourage accuracy. Picture stories will aid the imagination. A little color work will add interest and further aid in the development of the aesthetic nature. Freehand and Design will develop manual dexterity, and together with the use of sticks, tablets and solids, as advocated, will foster constructiveness. Symmetry will be of practical value in any walk of life, alike useful to the gardener and the dressmaker.

We deplore the too prevalent neglect of proper method in the teaching of this fascinating and important subject. We believe that the particular side of the child's nature it should seek to develop is, in many respects, by the means commonly employed, retarded rather than fostered.

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Drawing, if properly directed, will develop observation, concentration, perseverance, accuracy, dexterity, constructiveness, imagination, patience, perception of form, love of the beautiful, love of nature and nature's God. It will help to fit a man to enjoy and appreciate life and thus aid in the preparation for the life to come.

In conclusion we desire to say by way of encouragement that however unsuccessful your best attempts may appear to be, honest effort will develop your physical, intellectual, moral and religious being, the truest aim of all true education.

NOTE—The pupils referred to at the beginning of this chapter had done but little drawing; two had attended the kindergarten.

Material and How to Use It.

1. *Two pencils*, an H H for sketching outlines and an H B for lining in and shading.

2. A *trying square* which can be easily made out of an ordinary piece of paste-board cut in the form of a triangle having one right angle. This will be very useful in testing square corners and perpendicular lines.

3. A *pencil compass* for testing circles.

4. *Pen and ink* if it is to be used for lining in and shading instead of the H B pencil. Use good black ink. India ink is preferable.

5. A *knife* and piece of *sand paper* for sharpening pencils.

6. *Paper* which should be of the best quality. If drawings are to be made with pencil use the best drawing paper. It should have a hard, rough surface; if pen and ink use a hard, smooth surface paper.

7. An *eraser* of good rubber, one end of which should be pointed and the other wedge-shaped.

8. A *drawing board*, light and smoothly finished, about 12x18 inches. The paper may be tacked to this board. This will enable it to be held in proper position before the eye. If a drawing book is used it may be held to the board by two elastic bands.

PART I.

FREEHAND AND PRACTICAL DESIGN

1. What is Freehand Drawing?

Freehand Drawing is done with the *free* hand. The hand should not only be unassisted by ruler, compass, etc., but it should have plenty of room to move in any direction with perfect freedom. Tracing is not freehand drawing.

2. Position.

Seek to sit in a comfortable position. Keep the body fairly straight, but slightly inclined forward, so that the eyes are at the proper distance from the work to enable it to be seen to the greatest advantage. Give any support necessary with the left hand. Many recommend keeping the paper always in the same position—squarely in front. As a rule, we believe this is best. The paper may be turned to draw certain curves, so that the hand may form the centre. To prove the correctness of the work, it is a good plan sometimes to view the drawing with the paper in a different position.

3. Eye and Hand.

The eye, especially in drawing, plays a very important part in directing the movement of the hand. Hence it is of the greatest importance that the eye as well as the hand be well trained. The eye (*a*) to judge distance, (*b*) to distinguish form, (*c*) to see proportion, and the hand to obey promptly and accurately. Training the eye should precede training the hand, but at the same time we should strive persistently to train both to act in unison. During the whole of a course in drawing, we strongly recommend constant practice such as we have outlined.

4. Practice.

The following exercises are for the purpose of acquiring facility—the power to make the hand obey. You ought to learn to draw as you learn to write—to a certain extent automatically. We do not mean to say that you should be able to perform perfectly all the exercises here given before going any further. We merely submit them as sort of dumb-bell exercise to be taken frequently, in order to keep the hand and eye in proper condition.

Straight Lines. Vertical lines are drawn from the top down, horizontal lines from left to right, left oblique lines from left to right, right oblique lines either way, according to the degree of slant. There is no reason, however, why good muscular training is not obtained by drawing lines either way.

1. A carpenter in driving a nail keeps his eye on the nail—the objective point. Can you apply the principle involved to the drawing of a straight line? Place the pencil at a point from which you desire the line to commence. Fix the eye on the point at which you desire it to end and at the same time move the hand freely towards that point.

2. Make a number of straight lines, say three or four, on an unruled piece of paper as a sample of work you are able to do. Lay these aside and follow carefully the lines on a ruled piece of foolscap. Make a few more on the unruled piece of paper. Compare these with the others. Have you improved?

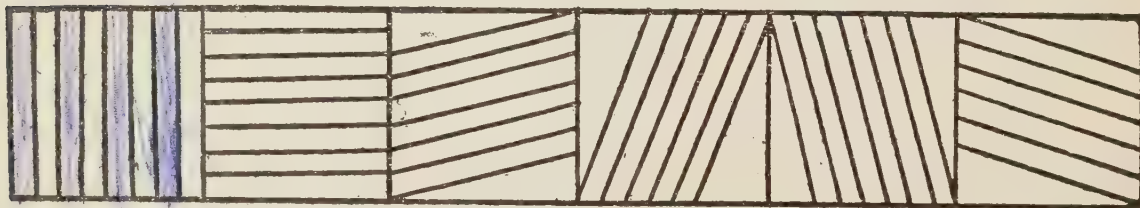


Fig. 3.

3. Draw a rectangle 6 in. long and 1 in. wide. By vertical lines divide

it into six squares. Fill the squares with parallel, vertical, horizontal and oblique lines.

Circles. 1. Make the circle freely, without sketching the diameters.



Fig. 4.

Do not attempt any definite size at first. The object should be to obtain a free circular movement.

2. Sketch the diameter of some definite length, 1 in., 2 in., etc. Draw the circle.

3. Sketch the radius of some definite length. Draw the circle.

4. Sketch an equilateral triangle. Draw as large a circle as you can inside.

5. Sketch a scalene, right angle. or isosceles triangle. Draw a circle inside. Outside.

6. Indicate three points by dots. Draw a circle passing through these points. Two points. Four points.

Angles. 1. Cut a pointed piece of paper. Draw an angle the same size as that on the pointed paper. Test the accuracy of the work by laying the paper on the drawing.

2. Bend a piece of wire to form an angle. Draw an angle of the same size. Test the accuracy of the work as before. Change the size and try again.

Measuring. It is not only good training but it is very necessary that you be able to measure accurately. Not only definite measurements as an inch, an inch and a half, etc., but proportionate measurements as well. Ruler and compass should be used only to test the accuracy of the work.

1. Draw a straight line 2 in. long, 3 in., $4\frac{1}{2}$ in., etc.
2. Draw a curve the ends of which are 2 in. apart, 3 in., $4\frac{1}{2}$ in., etc.
3. Draw a straight line of any length. A few inches from it draw another line of the same length. Half as long. Twice as long.
4. Draw a vertical line. Draw a horizontal line of the same length. Half as long. Twice as long.
5. Draw an oblique line. Draw another in some other position the same length. Half as long. One and a half times as long.
6. Draw a square with sides vertical. Oblique.
7. Draw a right angle triangle in different positions.
8. Draw an angle. Draw another angle in some other position of the same size. Twice as large. Half as large.
9. Draw a rectangle twice as long as it is wide.
10. Draw two lines of different lengths. Draw a rectangle having its sides equal to these lines.
11. Draw two lines of unequal length. Draw a rectangle having its sides one-half as long as the lines drawn.
12. Draw a line. Bisect it. Use this point as centre and draw a circle.
13. Draw a circle. Draw another circle the diameter of which is one-half of the diameter of the first circle.
14. Draw a rectangle on the black-board about two feet by three feet. Draw a rectangle on paper the sides of which are in proportion to the sides of the rectangle on the board.
15. Make two dots a short distance apart. Draw a line the length of which is the same as the distance between the dots.

16. Draw a line. Divide it into two equal parts. Three. Four. Five.
17. Draw a line. Examine it carefully. Cover it with a piece of paper. Draw from memory a line the same length. Half as long. Twice as long.
18. Draw a rectangle. From memory draw another the same size.
19. Draw a rectangle. Draw another of different size but having proportionate sides.
20. Draw a rectangle. Draw a straight line the same length as the diagonal of the rectangle.

5 Sticks and Angles.

As models, use sticks of a dark color, about 2 inches long. Lay these to form as many different designs as possible. Draw straight lines to represent these designs. Commence by using two sticks. The position of the line will represent the position of the stick. Here are a few samples :

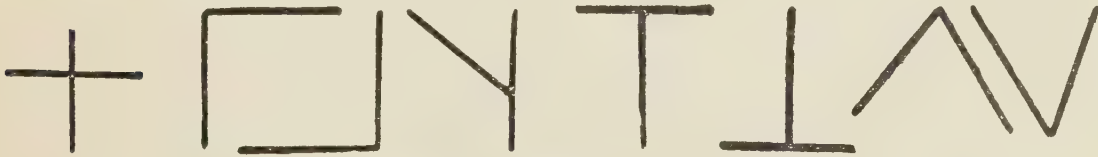


Fig. 5.

With three sticks something like the following may be made :

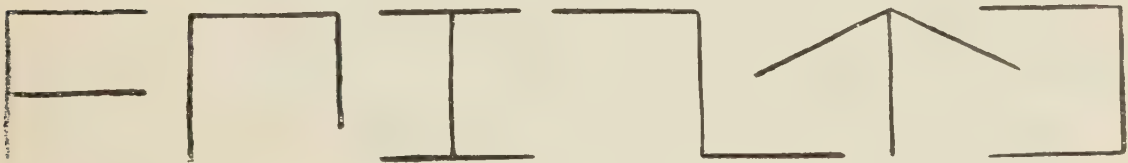


Fig. 6.

and with four or five :

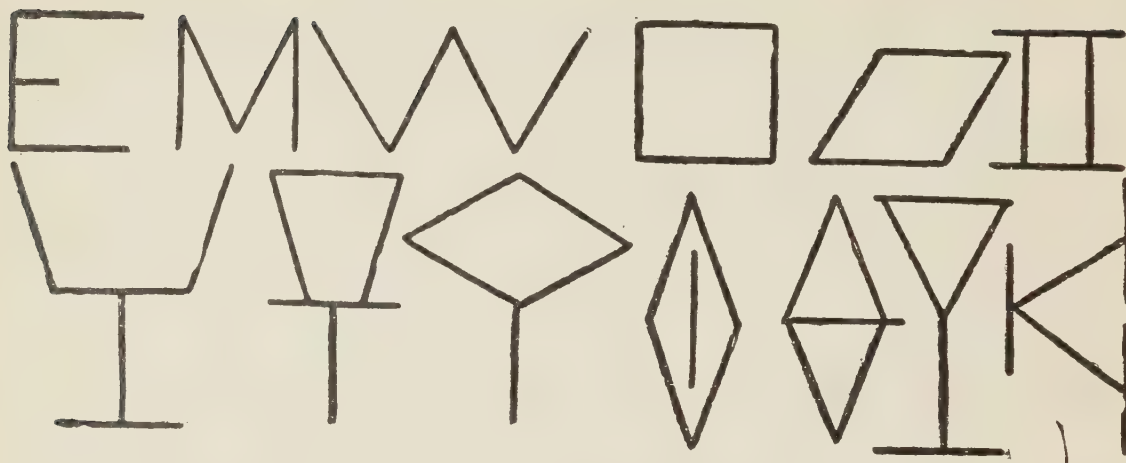


Fig. 7.

By increasing the number of sticks, a greater variety may be made.

By using a large number of sticks, very nice borders may be constructed, after which they should be drawn.

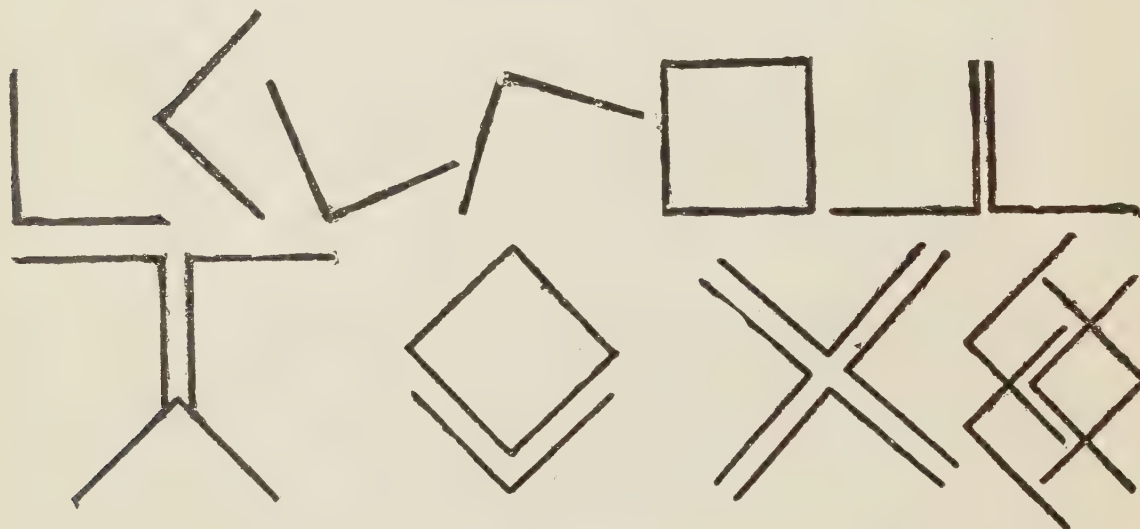


Fig. 8.

For this exercise, use pieces of wire bent to form angles. Commence

by using one piece to form a right angle. Lay it in different positions. Draw it in these positions. Next use two, three or four. As with the sticks the number of designs will increase with the number of angles used.

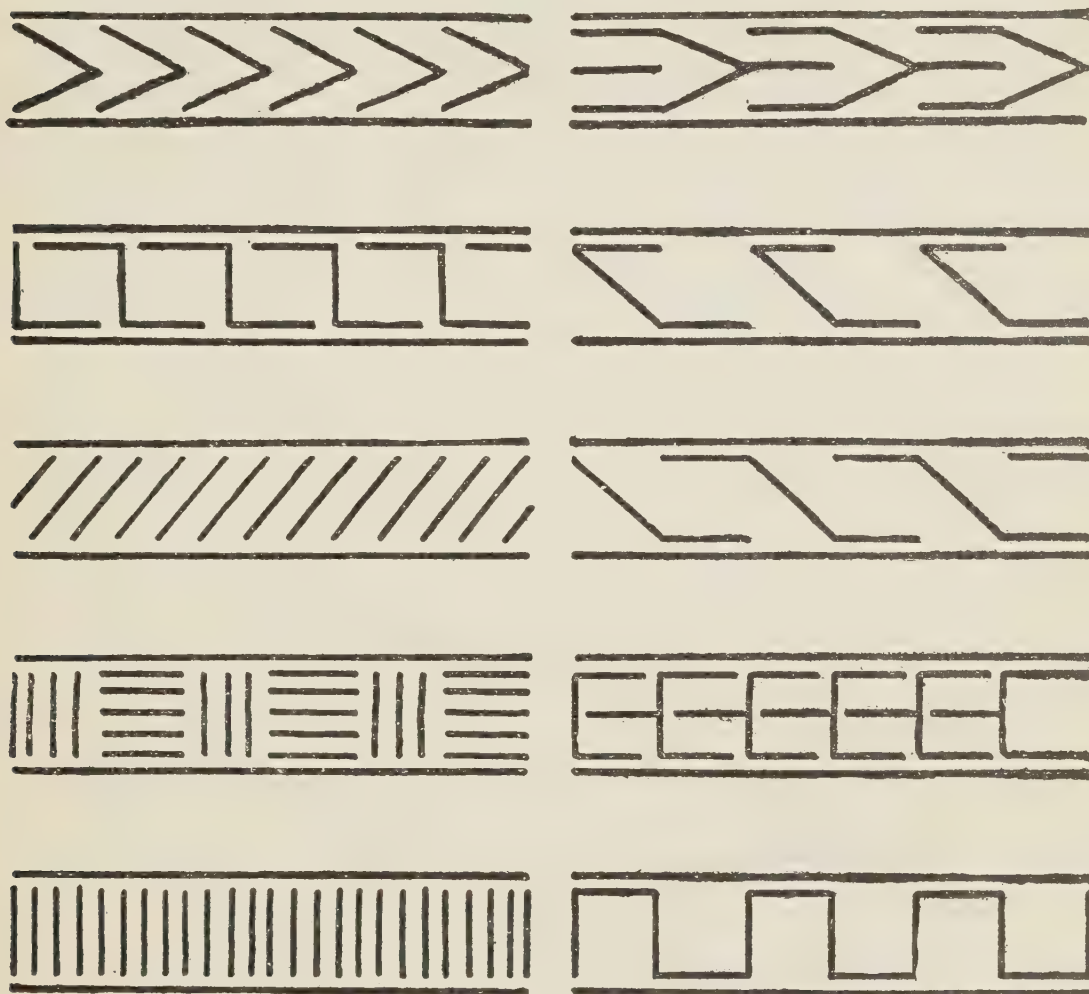


Fig. 9.

After some practice in drawing right angles, use acute and then obtuse angles. Very pretty designs may be made by combining the three.

There are advantages in drawing from models in this way. The designs are more easily made, and only those which are pleasing may be drawn.

6. Symmetry.

Symmetrical about an axis.

By symmetry in drawing is meant that whatever is done to one part of a design is done to every other corresponding part.

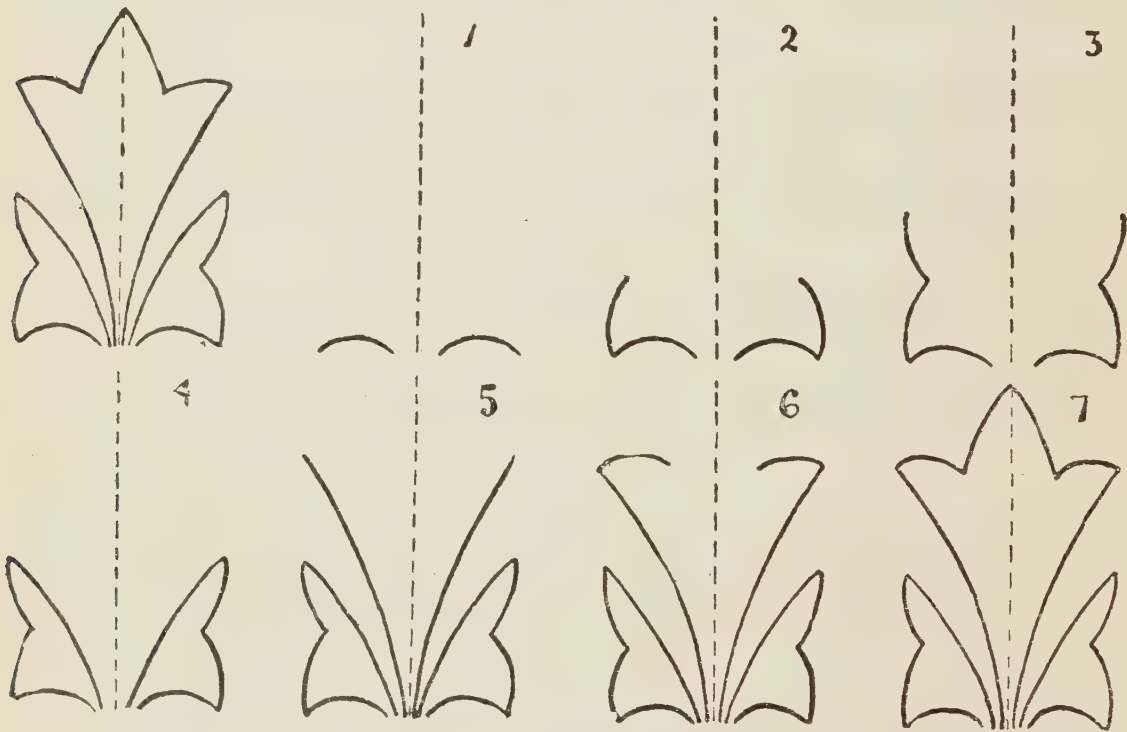


Fig. 10.

In the design shown in fig. 10, notice that it may be divided into two parts, the right and the left, separated as shown by a dotted line. If the paper were folded at this line the right side would exactly fit upon, or would coincide with the left. It is therefore *symmetrical*. Because it consists of *two* symmetrical parts, separated by a *straight* line, it is said to be *symmetrical about an axis*.

Our illustration shows the proper method of drawing such designs. Sketch the axis and build up the design part by part, bringing both sides along together. This is a much better way than by finishing one side before commencing the other.

If these facts are kept in mind when making the examination, many designs which at first seem very complex will turn out to be quite easily made.

Examine the following carefully, sketch the axis, and draw as we have recommended.



Fig. 11.

Symmetrical about a centre.

The design in fig. 12 is made up of four similar parts. It is also symmetrical about an axis, viz., A B or C D. Each part also is symmetrical about an axis. The whole figure therefore is symmetrical about a point at which these axes intersect. It is said to be *symmetrical about a centre*.

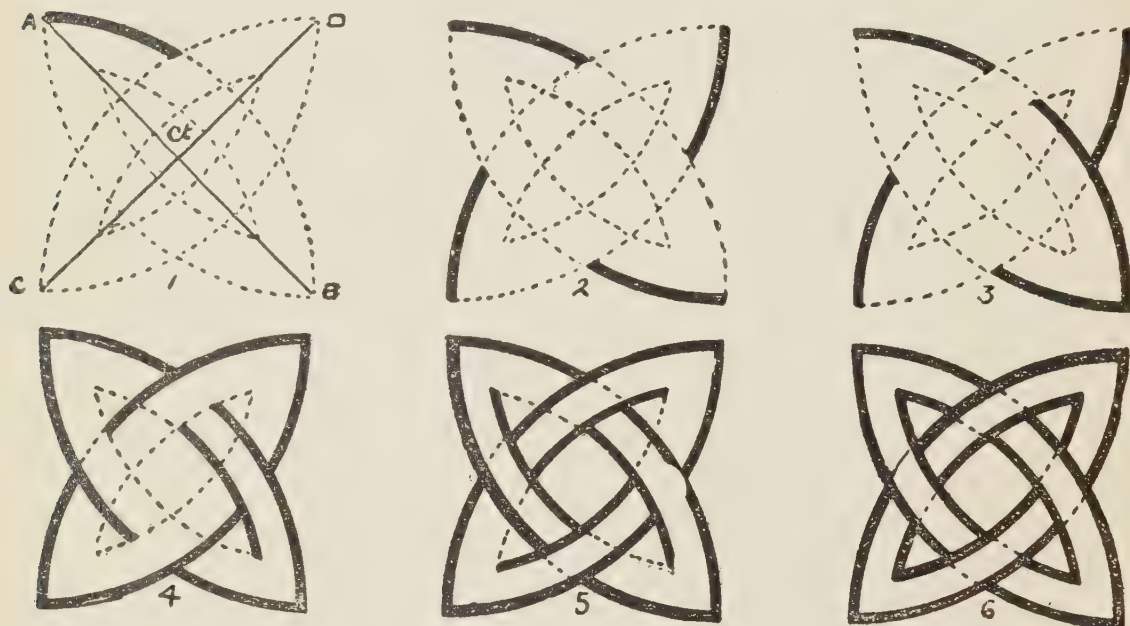


Fig. 12

To draw such figures first indicate the centre, sketch lines to define the different parts and proceed to build up in the same manner as before.

Other examples are given in fig. 13.

Problems.

1. Sketch a vertical line and using it as an axis construct a design consisting of four straight lines on each side.
2. Draw a design, symmetrical about an axis which is three inches long, the design to be made up of simple curves.
3. Sketch a square about 2 in. a side. Indicate the centre by a dot. Construct a design of simple curves symmetrical about this centre.

4 Draw four straight lines to form a design symmetrical about an axis.
About a centre.

5. Draw a triangle. Divide it into three equal triangles. In each of the equal triangles construct a design, symmetrical about an axis, so that the whole is symmetrical about the centre of the original triangle.

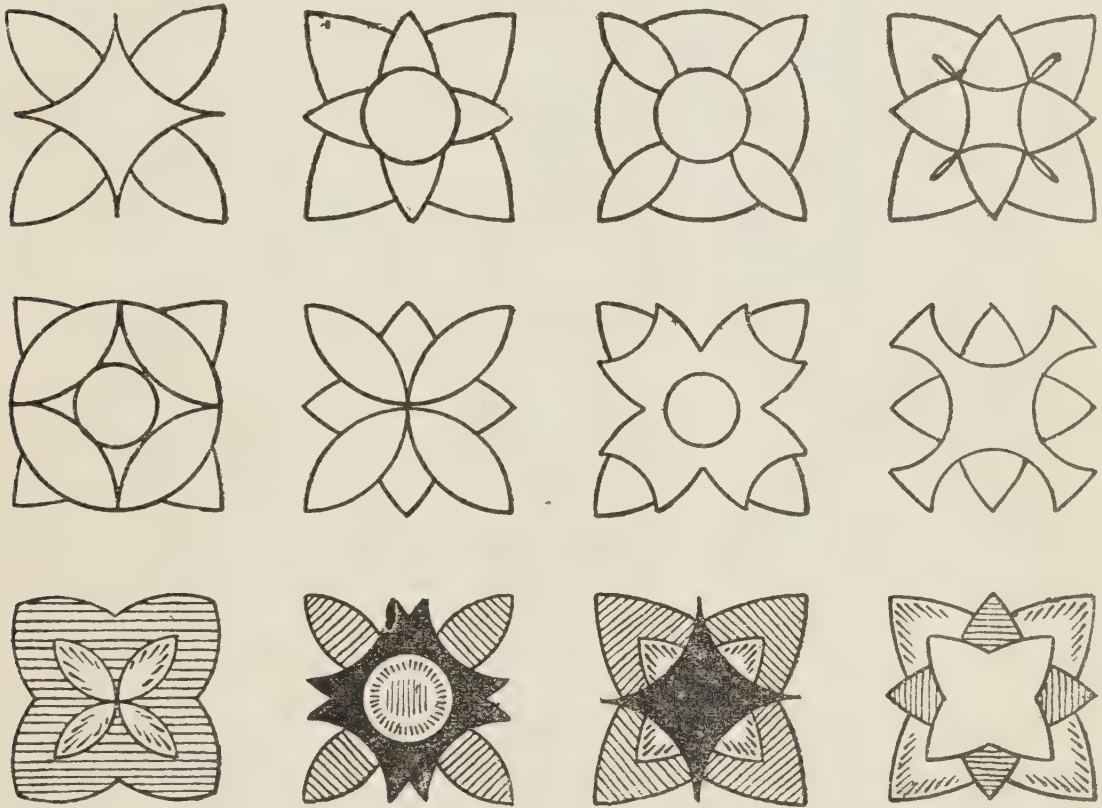


Fig. 13

7. Straight Line Designs.

After being able to draw straight lines fairly well in any position, practise placing them together to form a design.

The following examples illustrate the principle of symmetry about the centre of a square. Keep this in view in making all drawings of this kind.

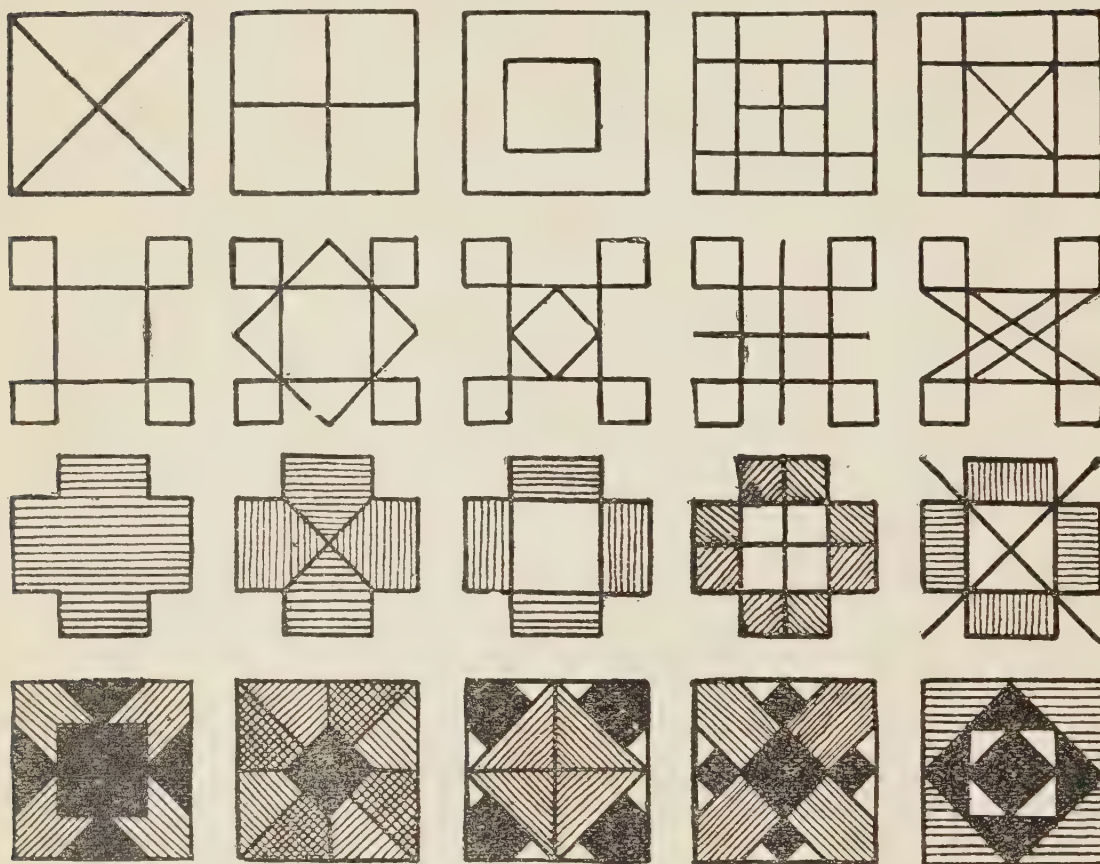
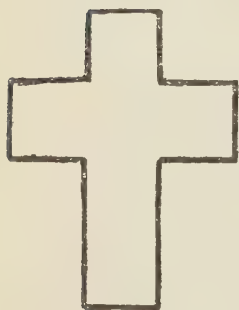


Fig. 14

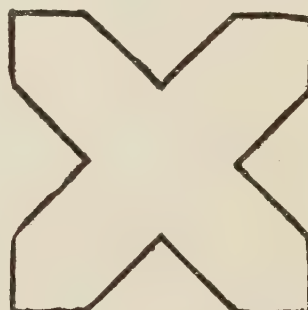
A. is an example of the Latin Cross, B. the Maltese Cross, C. the



A



B



C

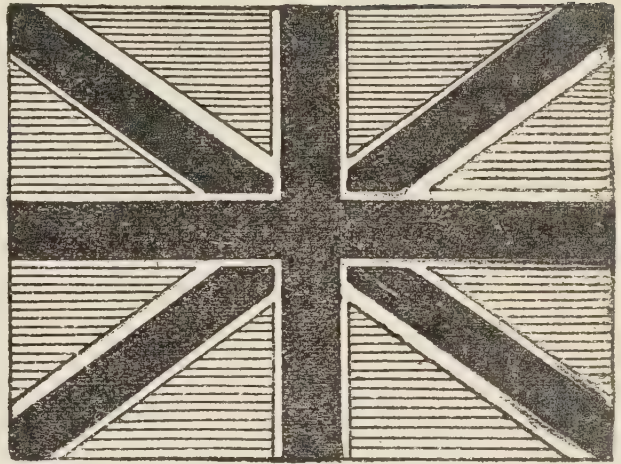
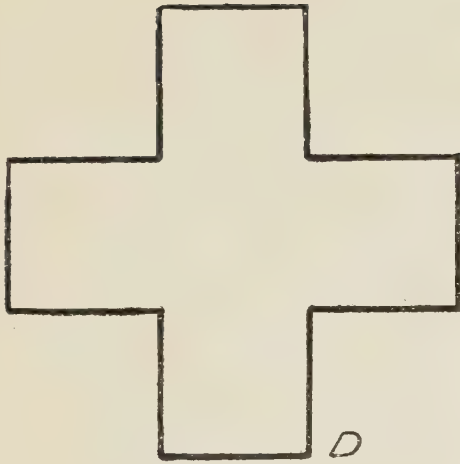


Fig. 15

Cross of St. Andrew and D. the Greek Cross.

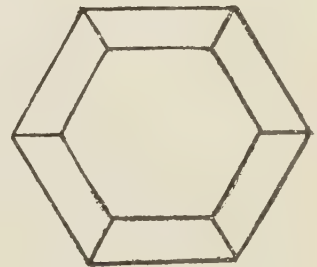
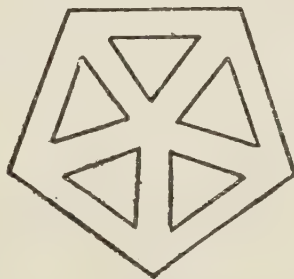
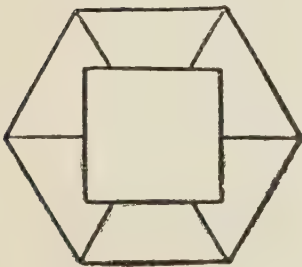
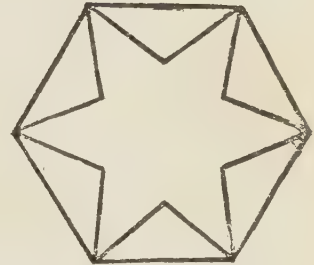
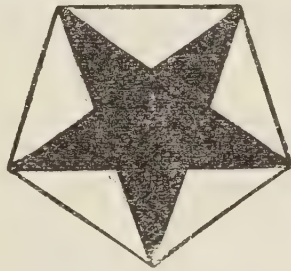
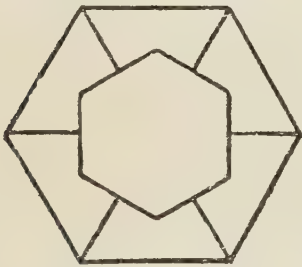


Fig. 16

The pentagon and hexagon may be used to good advantage as a basis of many very pretty designs. See fig. 16.

8. Simple Curve Designs.

A simple curve is part of the circumference of a circle.

Practice drawing simple curves in different positions as shown below. Do not turn the drawing paper when practising.



Fig. 17

Combine a number of simple curves to form a design. The following are symmetrical about the centre of a square. Many other examples are given in fig. 13, page 23.

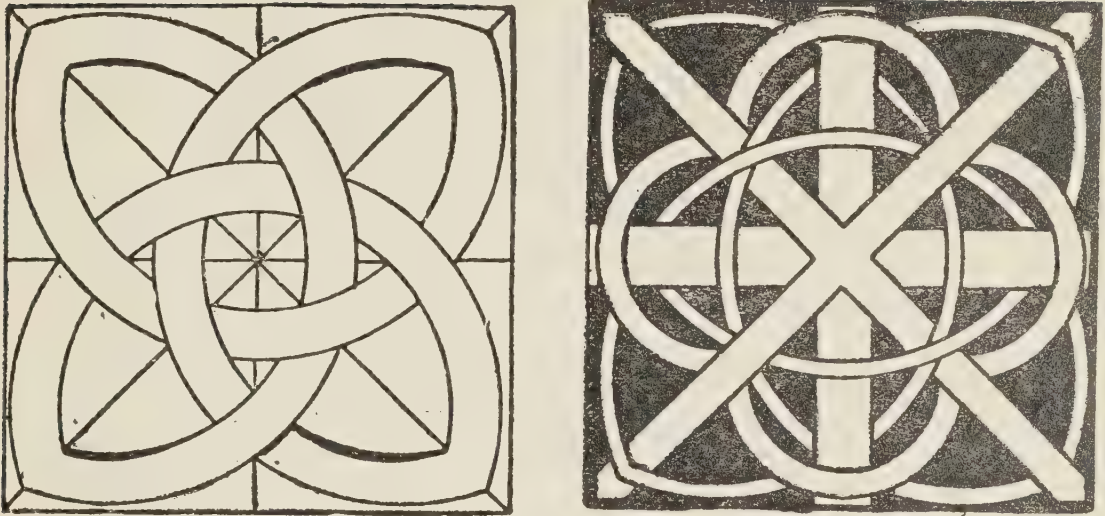


Fig. 18

A figure being symmetrical about a centre may be composed of any number of parts, as the following examples which are symmetrical about the centre of a circle will show. See also fig. 24.

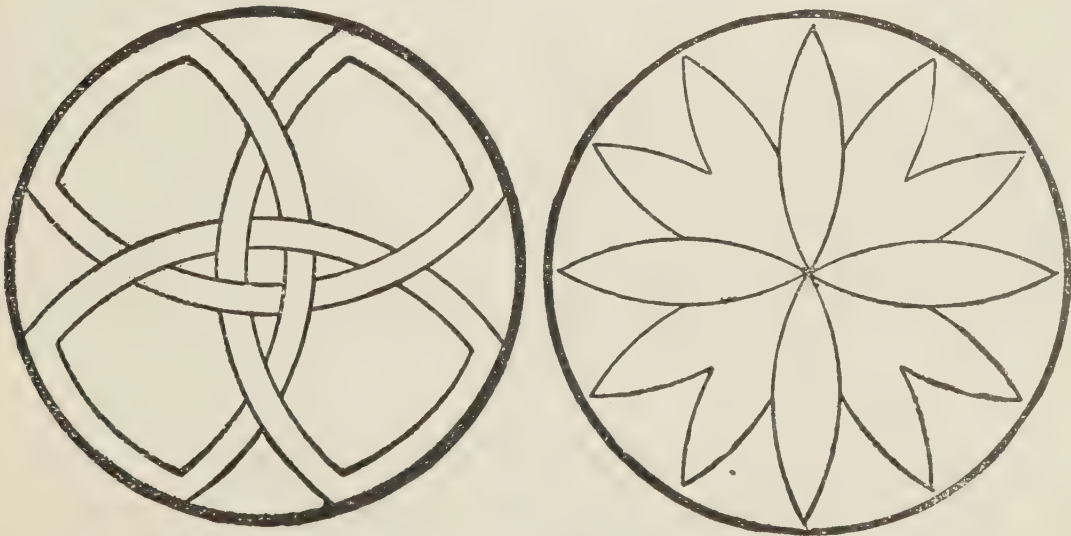


Fig. 19

Any of these designs if made smaller may be used as a unit for repetition in a border.

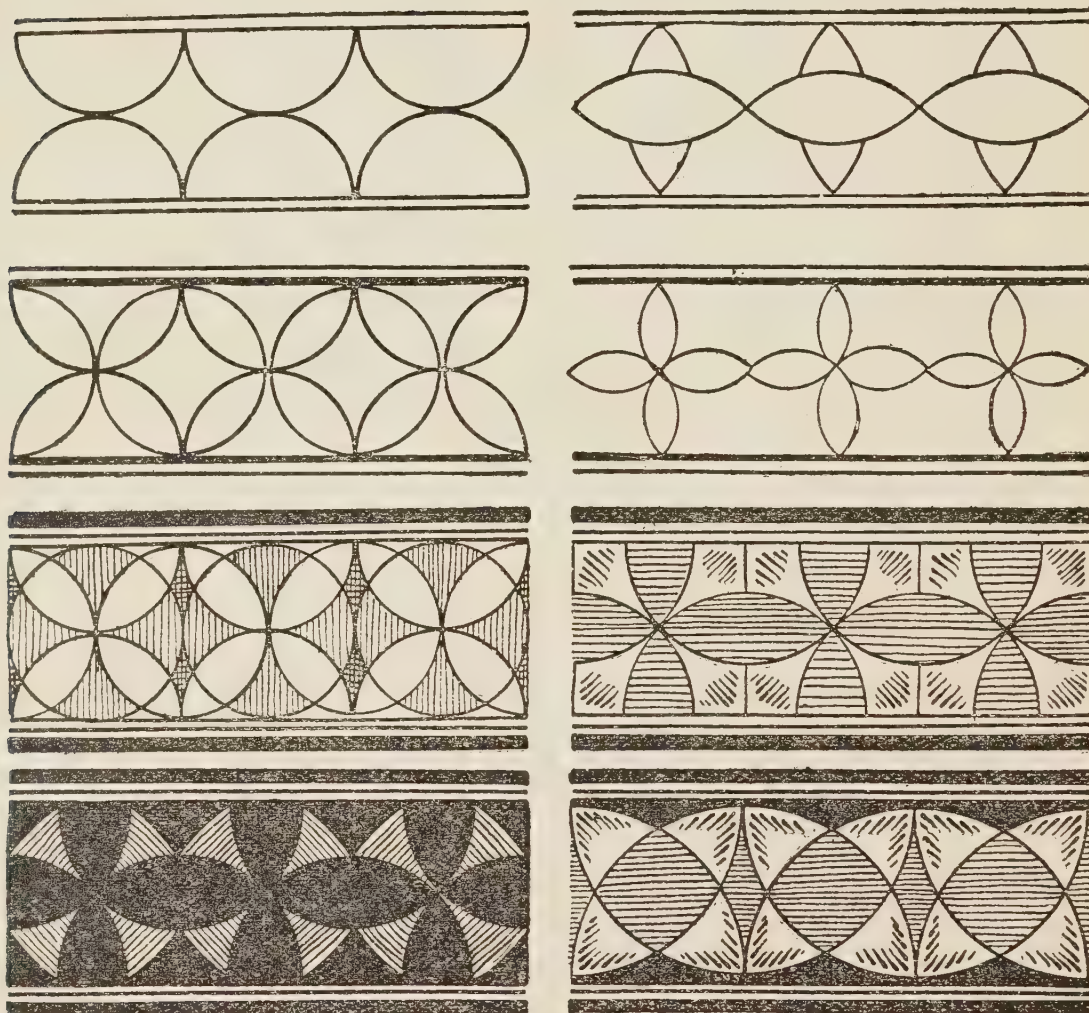


Fig. 20

9. Simple Curves and Straight Lines in Combination.

Next attempt combining straight lines and simple curves.

The following examples are symmetrical about the centre of a triangle.

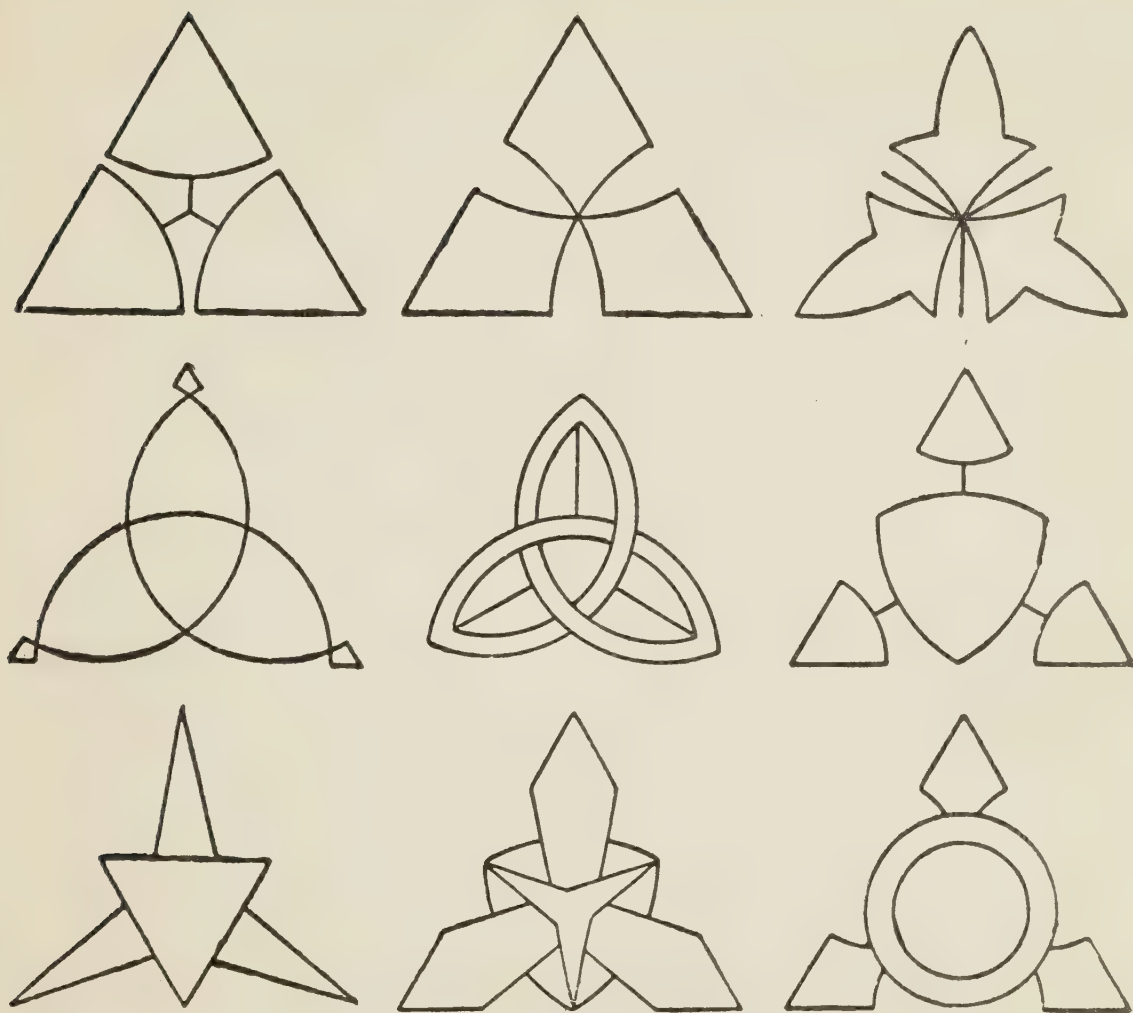


Fig. 21

Designs for many articles such as butter dishes, pitchers, vases, etc., are composed of straight lines and simple curves.

Problems.

Make designs, using only straight lines and simple curves, of the following :

- | | |
|------------------|-------------------|
| 1. A teacup. | 4. An ink bottle. |
| 2. A flower pot. | 5. A lamp. |
| 3. A vase. | 6. A stair post. |

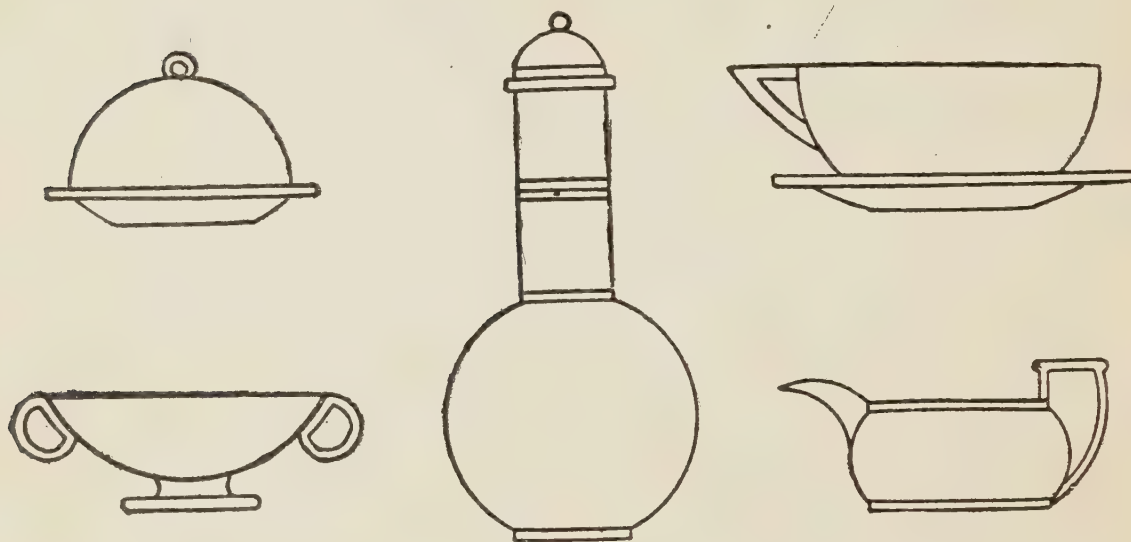


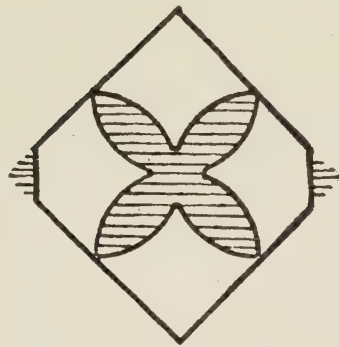
Fig. 22

10. Ornament.

The purpose of ornament is to add interest.

To discuss fully the principles of ornament in a work of this kind would be impossible. The following hints should be carefully observed :

1. All ornament should be appropriate to the purpose for which it is intended. Examine the designs submitted in *Backgrounds or Space-filling*.
2. All units should be pleasingly repeated and balanced.
3. There should be a feeling of restfulness.
4. Avoid excess. Too much drawing will destroy the effect. Draw only what is necessary to produce the desired result.
5. Strive to obtain variety.
6. Be original. Do not be content with making mere copies.



UNIT

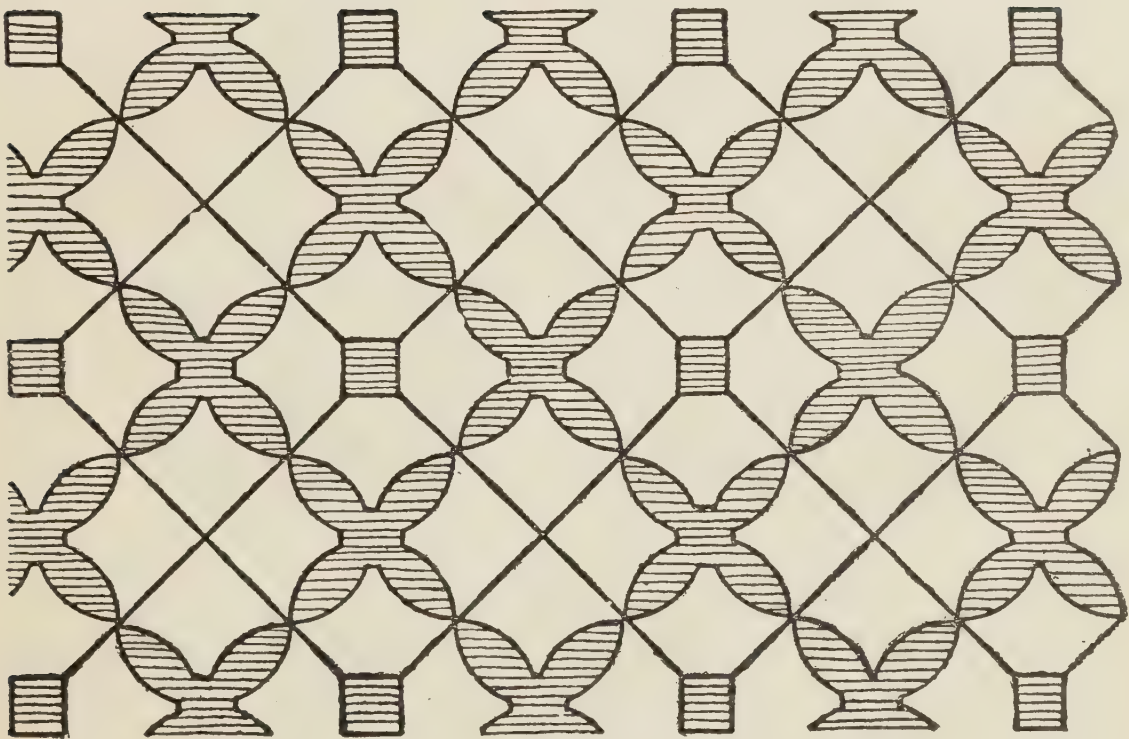


Fig. 23

7. Design and ornament for a purpose.

Problems.

1. Sketch the outline of a square. Ornament it to make a unit suitable for an oilcloth. Repeat the ornament to show the method of proposed repetition.
2. Draw a straight line design suitable for a border. Show the method of repetition.
3. Make a carpet design and show the method of repetition.
4. Draw a design suitable for the border on a table cloth.
5. Construct a design based on the square to be used on a window blind.

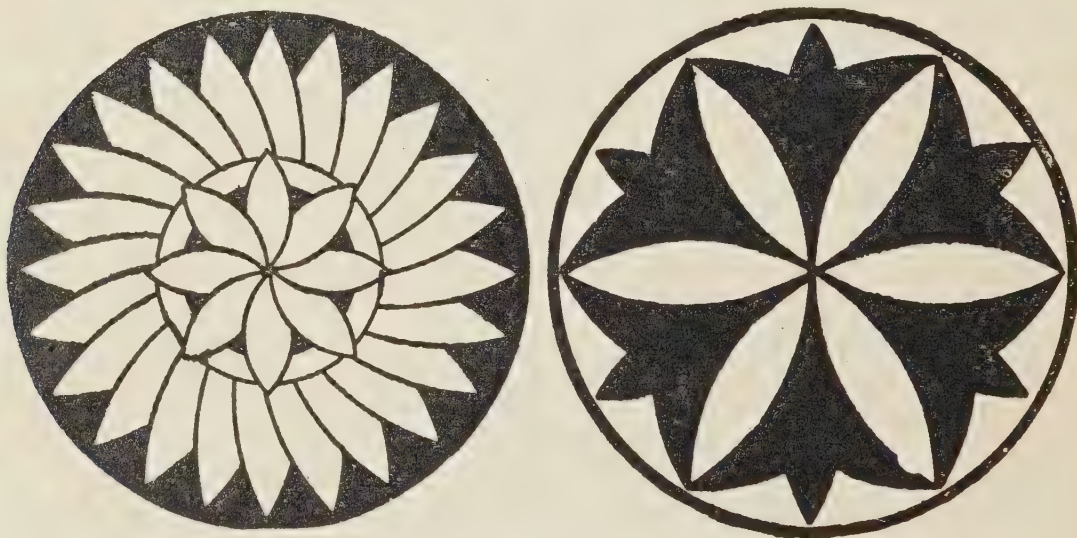
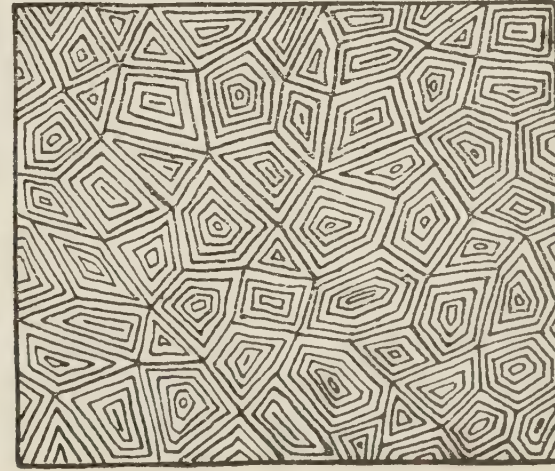
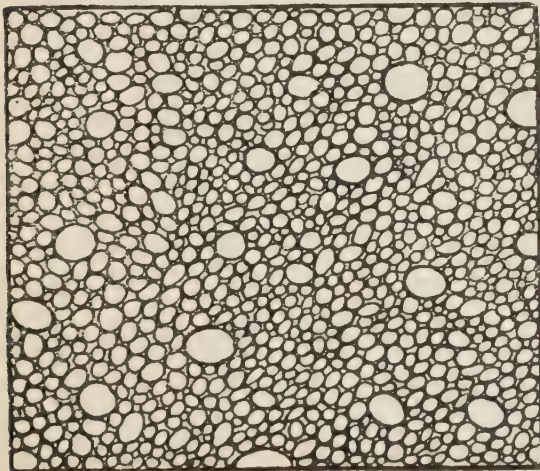
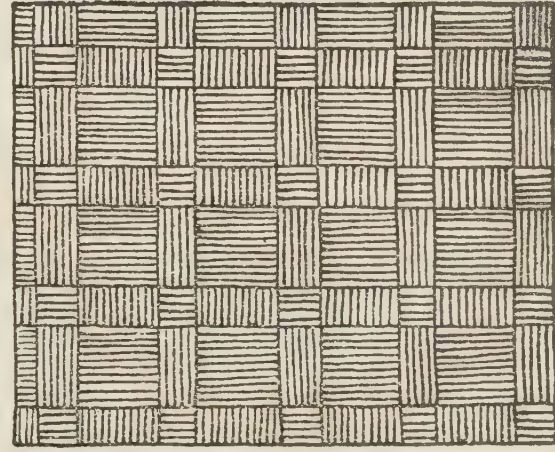
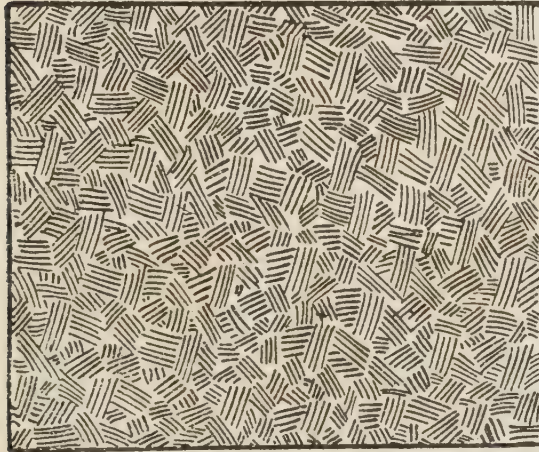
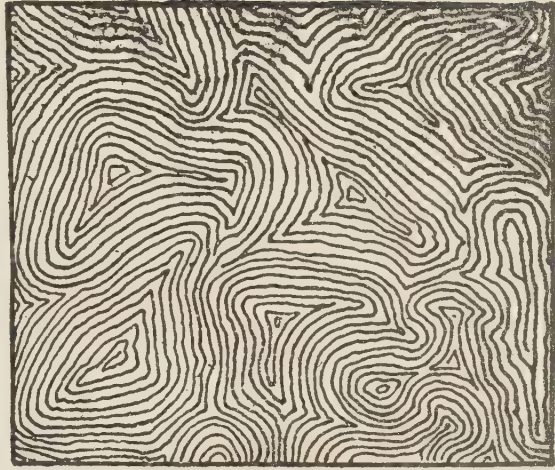
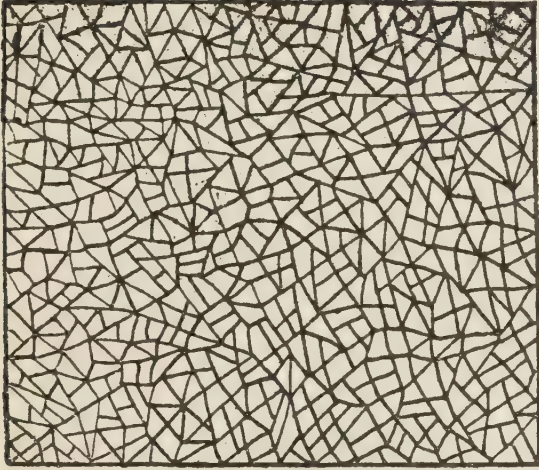


Fig. 24

11. Backgrounds or Space-filling.

A very pleasing effect is produced especially in ornamental work by the use of an artistic and appropriate background. It will serve to emphasize the design itself as well as to produce a finished appearance. It is unnecessary to give any specific direction as to the manner of making the background. A few examples appropriately used will be sufficient to give suggestions, and by exercising a little ingenuity a large number of designs may be invented.



In addition to the examples of what may be made for background we submit the following simple designs to show how such backgrounds may be used.

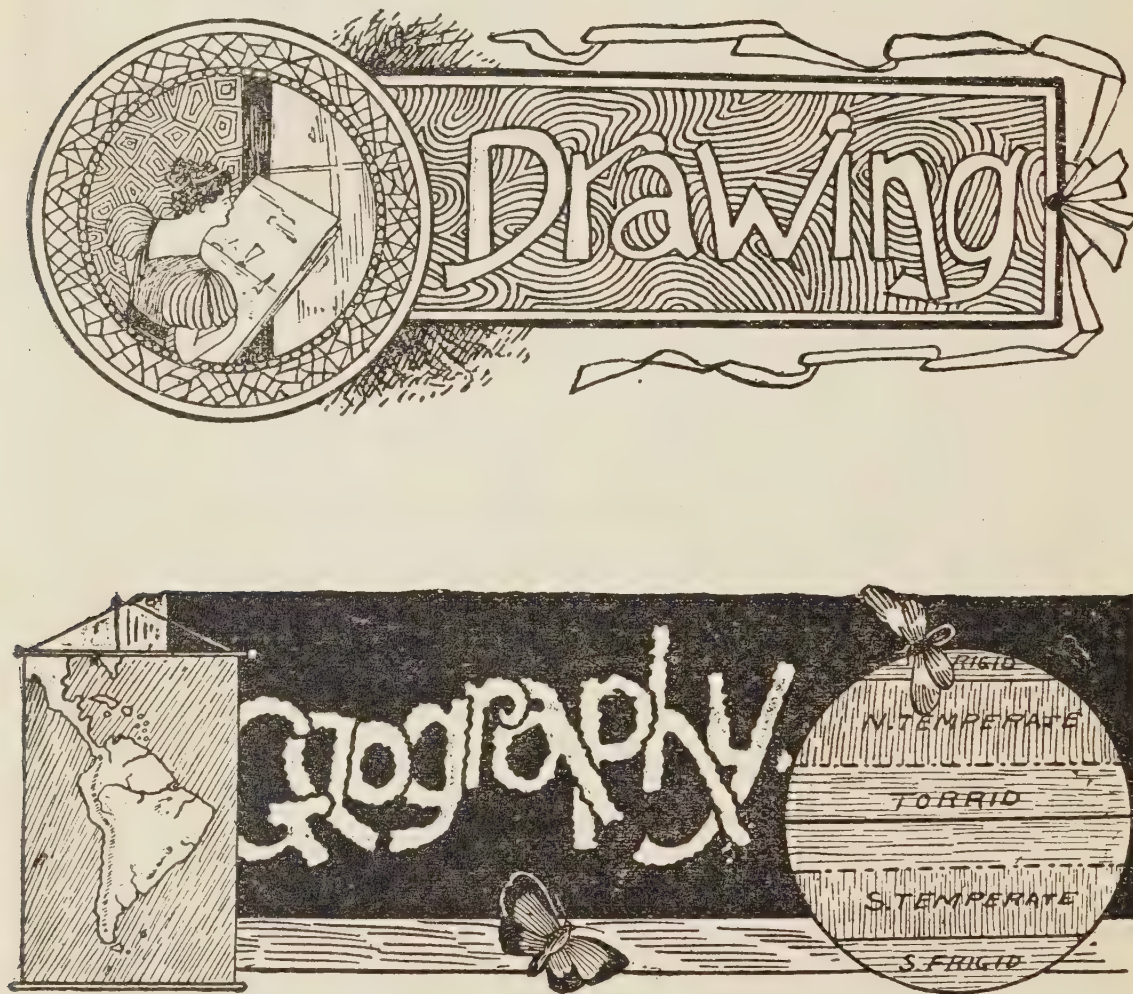


Fig. 25

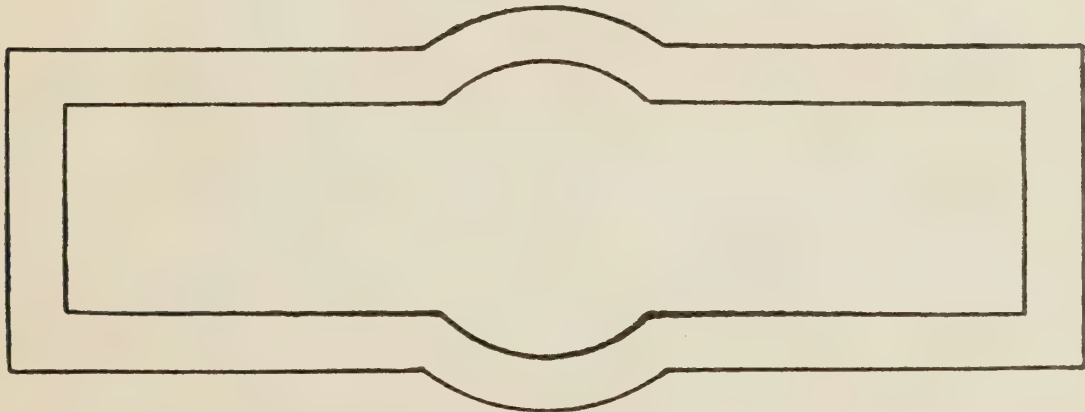
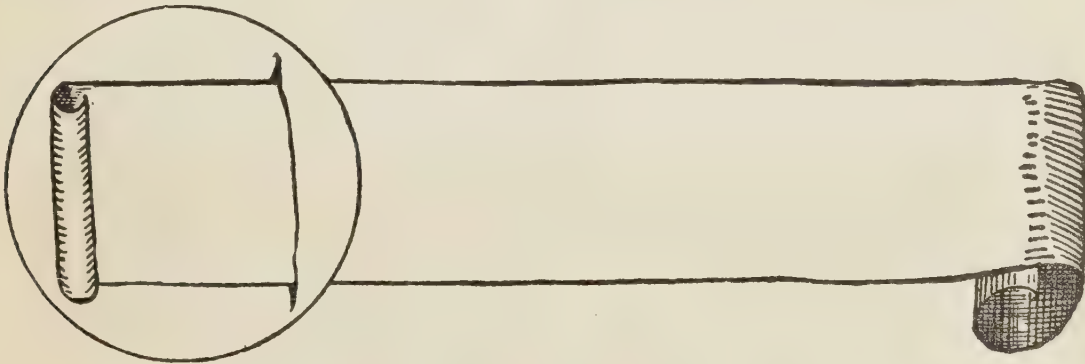
Various other applications may be noticed in many of the designs that follow. For others examine oilcloths, carpets, etc.



Fig. 26

Problems.

1. Sketch the following designs, print a suitable motto and fill in the background.



2. Make designs for the months.
3. Draw a rectangle about 6 in. x 2 in. Within the rectangle print WELCOME. Fill in the background.
4. Use an ornamented square in an oilcloth design.
5. Draw a circular design similar to fig. 24 suitable for a ceiling centre piece.

. Tablets.

By using the square, circular, and triangular tablets, many pleasing designs may be made. Commence by using four or five squares. Arrange these and draw them in as many ways as possible. By increasing the number of tablets of course a greater variety of combinations may be obtained.

The circle :

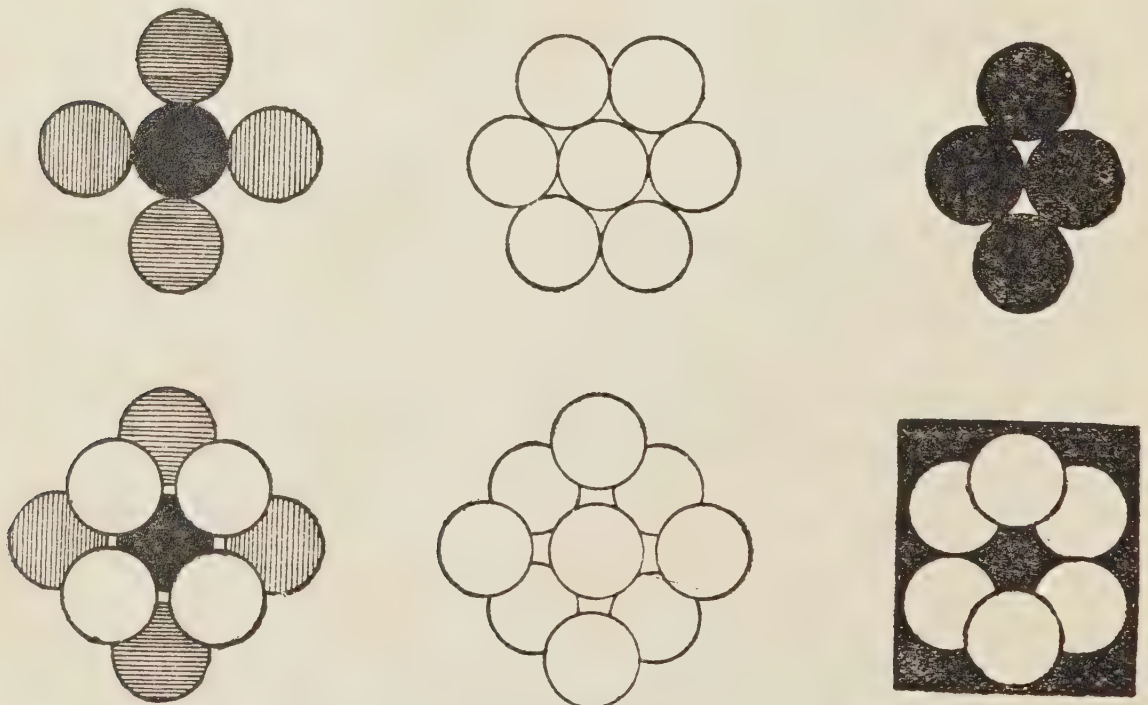


Fig. 27

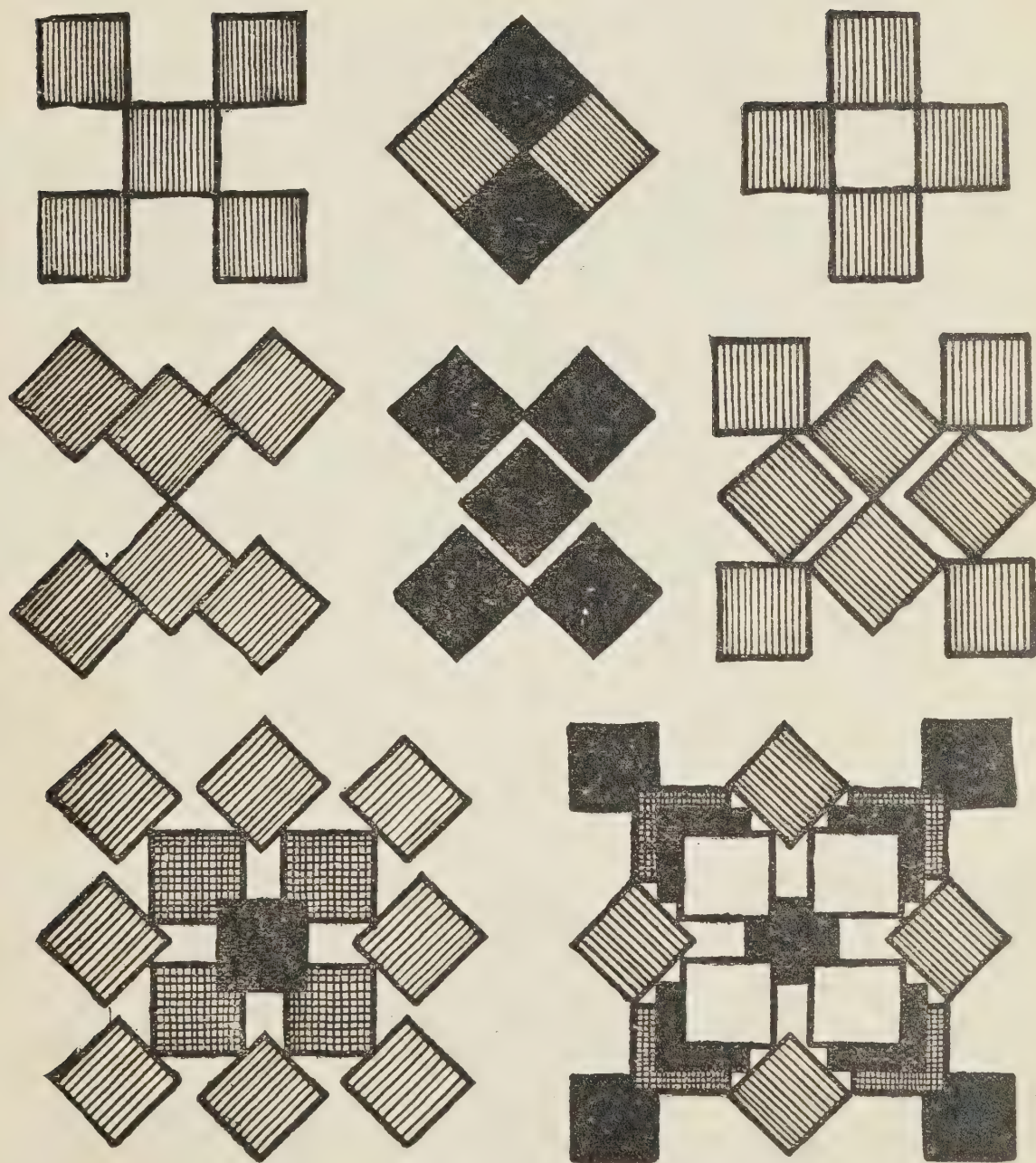


Fig. 28

The triangle :

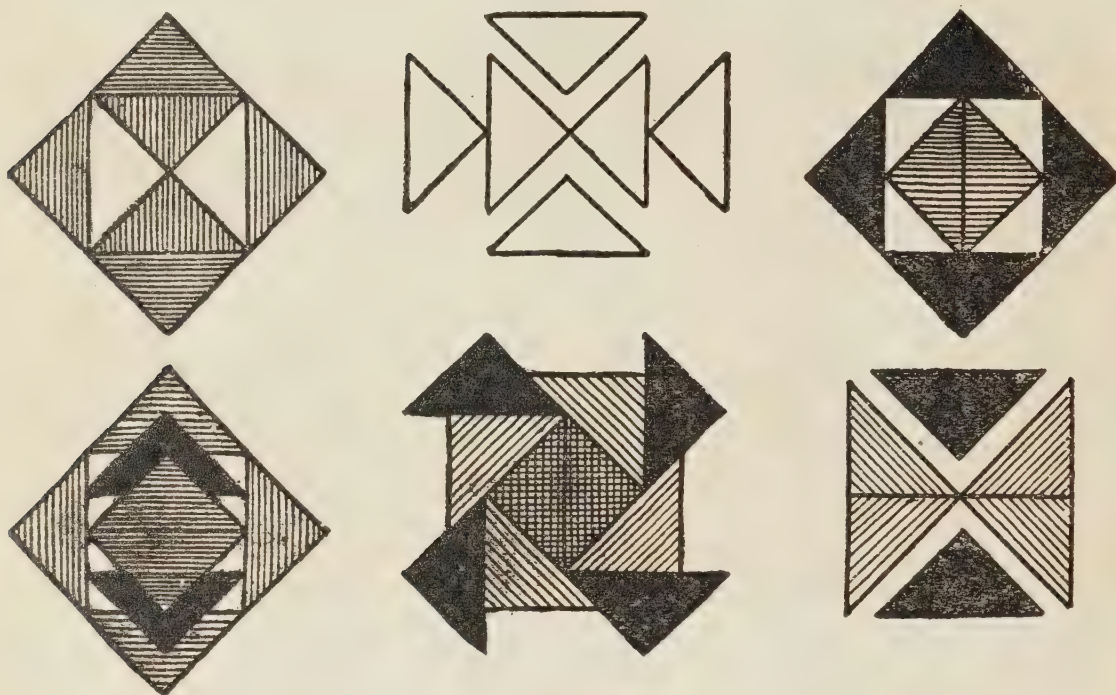


Fig. 29

Sticks and tablets may also be used in combination with good effect.

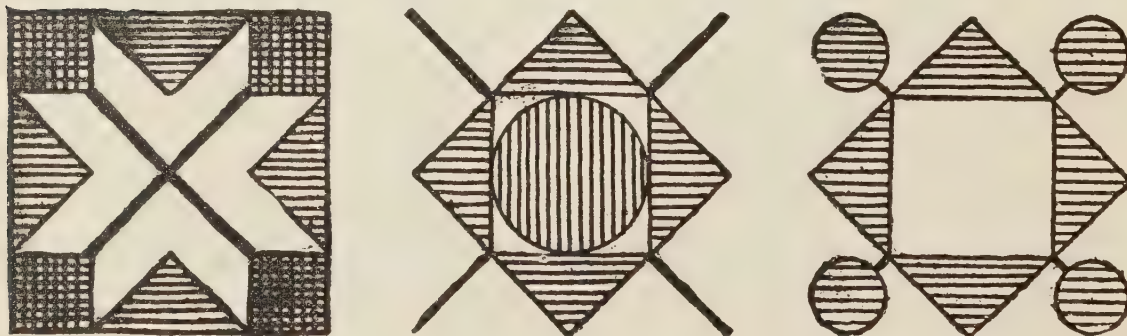


Fig. 30

Here are two examples suited for linoleum. They show what may be done with the square, triangle and circle in combination.

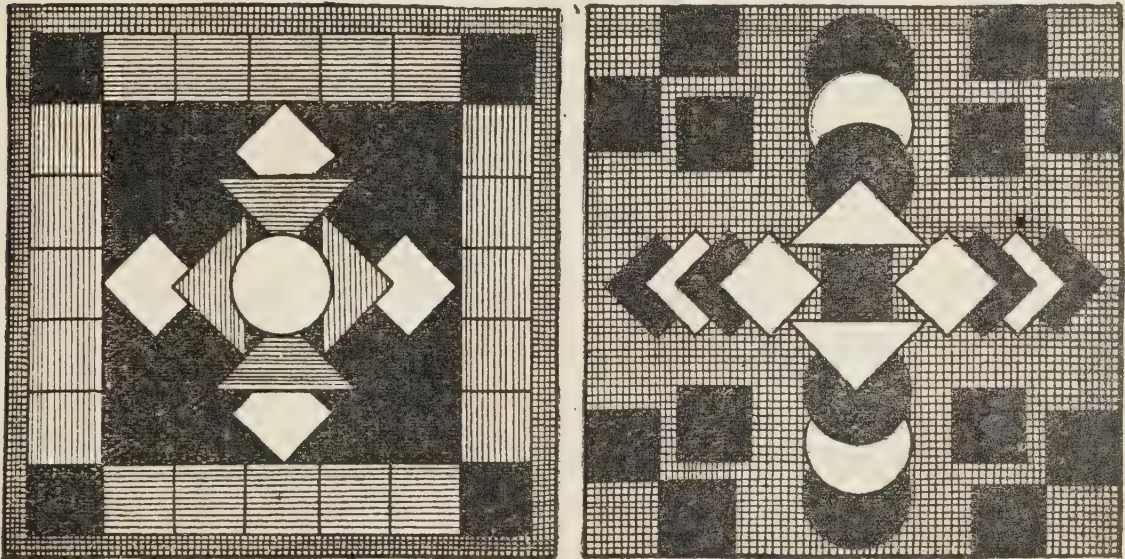


Fig. 31

Very nice borders may be constructed by using the square as a unit. At

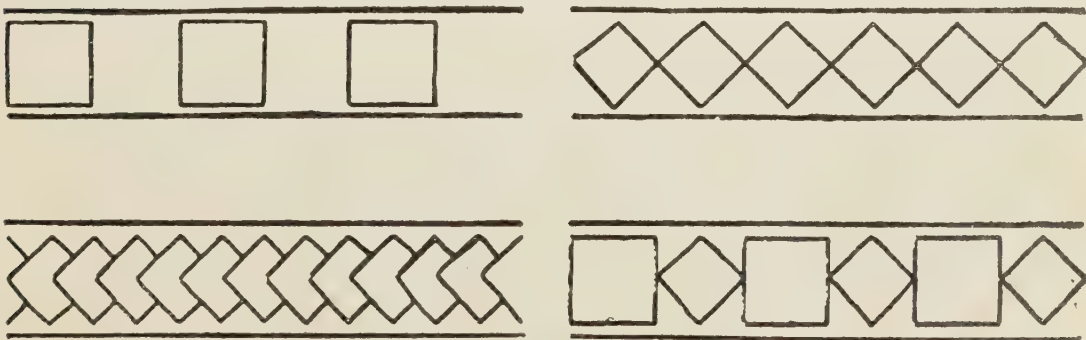


Fig. 32

first sketch horizontal lines as axes upon which to lay the models and make the drawing. After some practice, however, the eye should be the only guide.

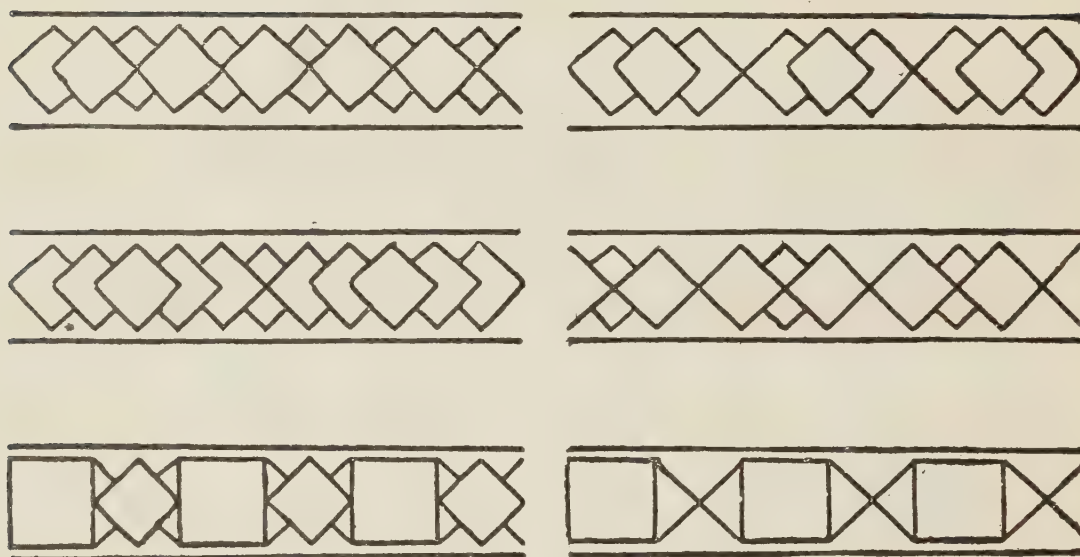


Fig. 33

The triangle :

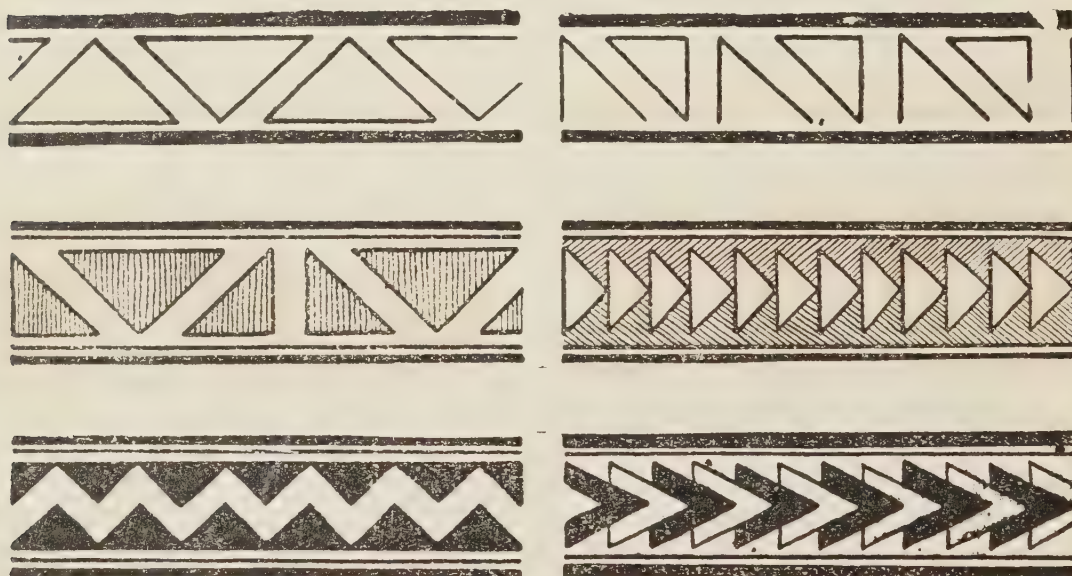


Fig. 34

The circle will give examples something like the following :

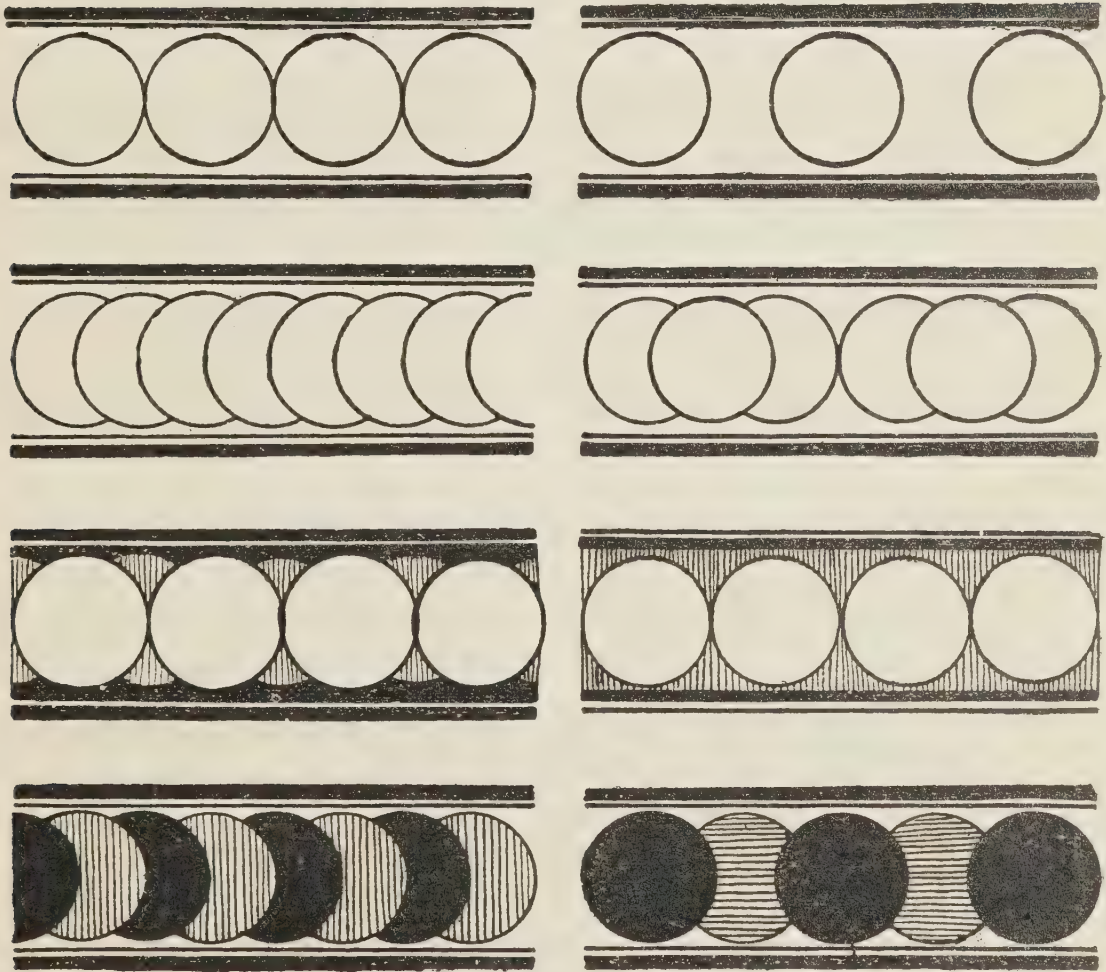


Fig. 35

The appearance of these may be much improved by ornamenting the repeated unit or filling in the background.

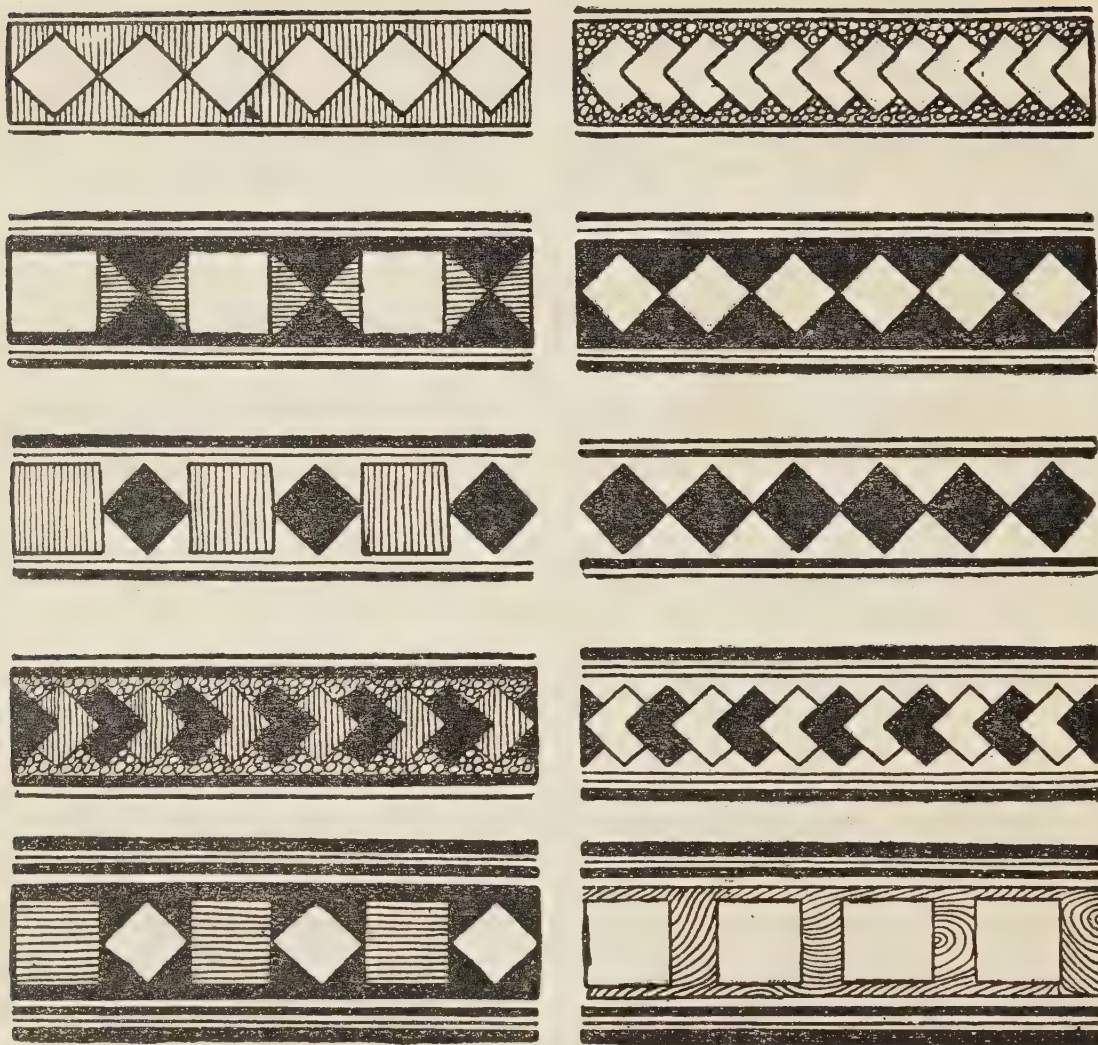


Fig. 36

These, with combinations of the sticks, square, triangle and circle will give an endless number of very pretty designs. See fig. 37.

After some practice in drawing from designs made as we have suggested, invent new ones without the aid of the models. Do not be content with copying something that someone else has made, or merely making a new

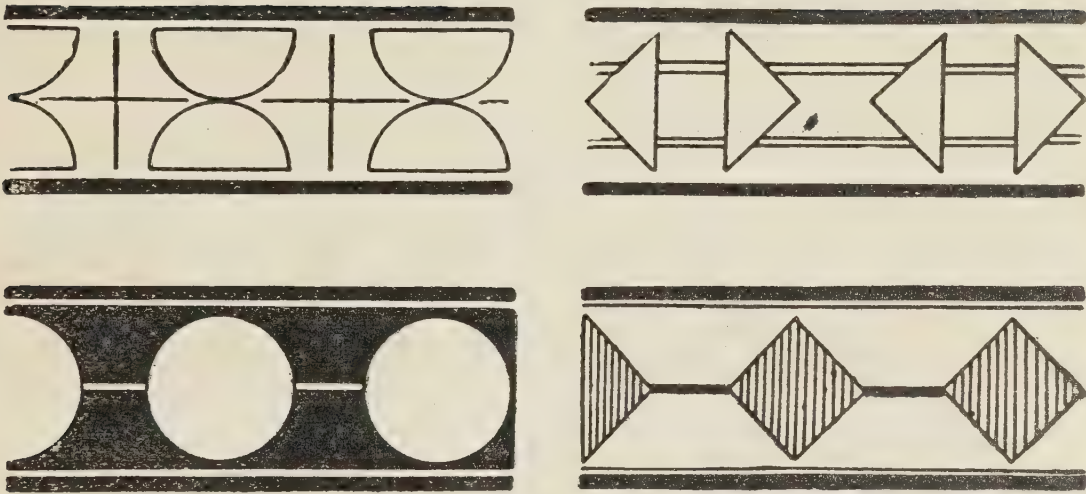


Fig. 37

design, but endeavor to make all drawings for a purpose and as pleasing as possible.

13. Compound Curves.

A simple curve as before stated is part of the circumference of a circle. It therefore bends regularly ; in other words it changes its position at every point. A simple curve if continued will make a circle—it is struck from *one* centre.

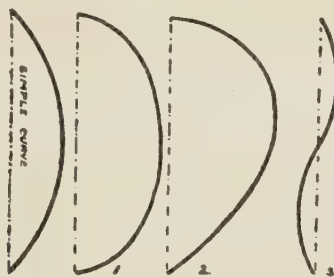


Fig. 38

A compound curve does not bend regularly throughout its whole length. It is struck from two or more centres. The degree of curvature may change at every point in the *ellipse* (1) or at intervals as in the *oval* (2), or the direction may be reversed entirely as in the *ogee* (3). See fig. 38.

The accompanying figure shows modifications of the ogee. Practice

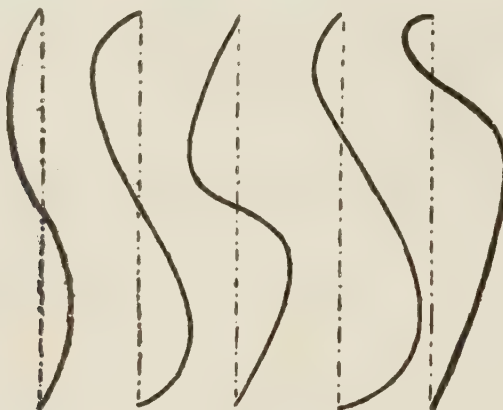
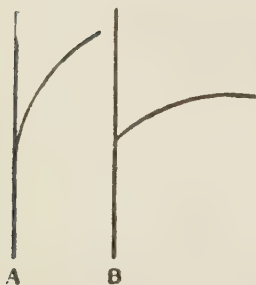


Fig. 39

drawing these in different positions. Do not at first try to get them of any definite length. Be sure to draw the whole line without stopping and do not make a very abrupt change in the direction.



In uniting curves with other curves or with straight lines, in order to produce a beautiful and pleasing result, care must be taken to have them run gradually into the direction of each other. A in our illustration is much more pleasing than B.

After some practice in making curves of indefinite length practice making curves of some stated length. Make two dots, say 2 or 3 inches apart. Connect these points by a compound curve. After becoming fairly proficient

in doing this, combine curves to form designs. Here are a few examples for practice. Invent others.

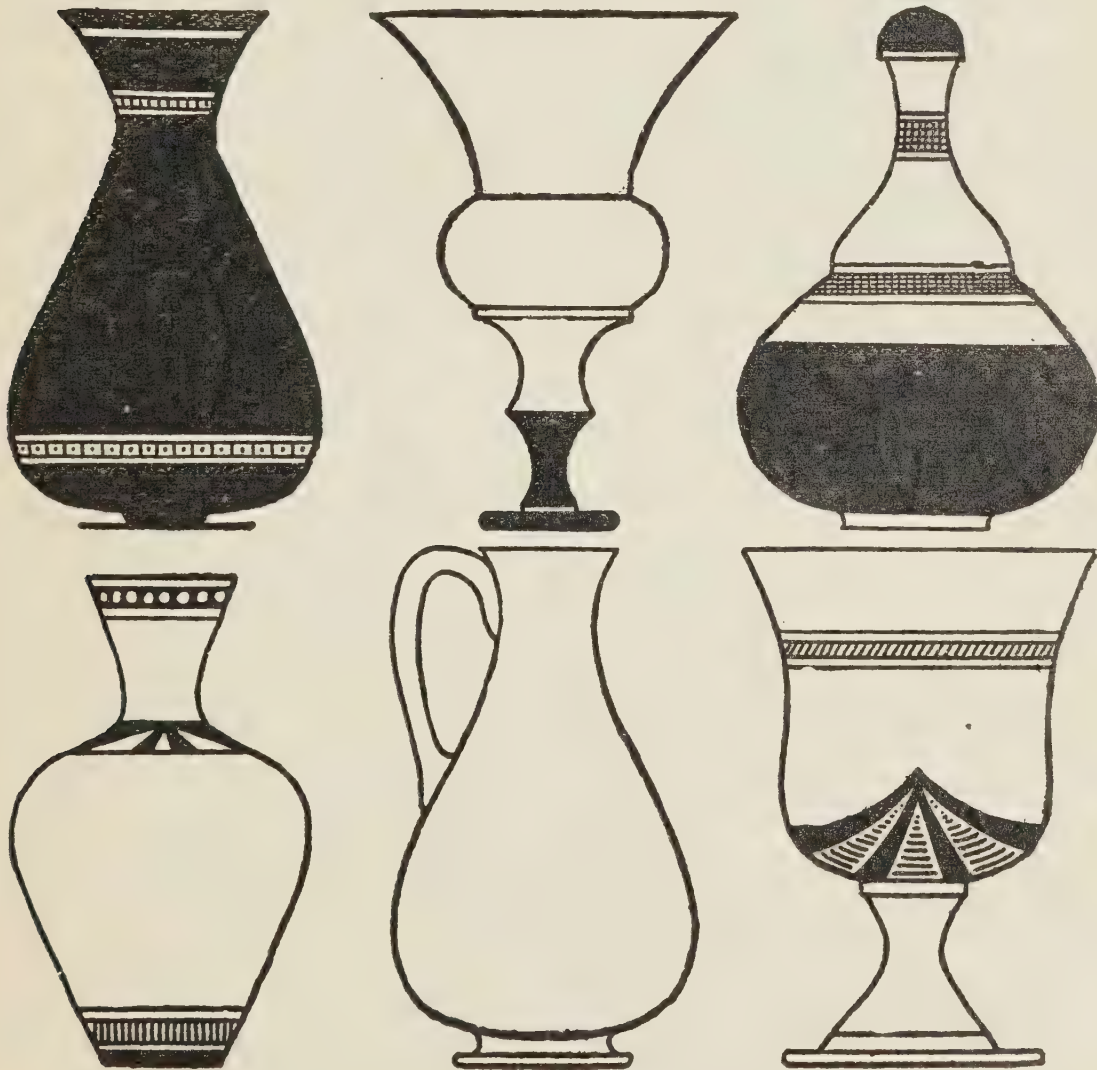


Fig. 40.

Other examples will be found under *Symmetry*.

14. The Double Loop.

The double loop is a difficult compound curve to make. A page of practice might look something like this. The use of this curve is not so

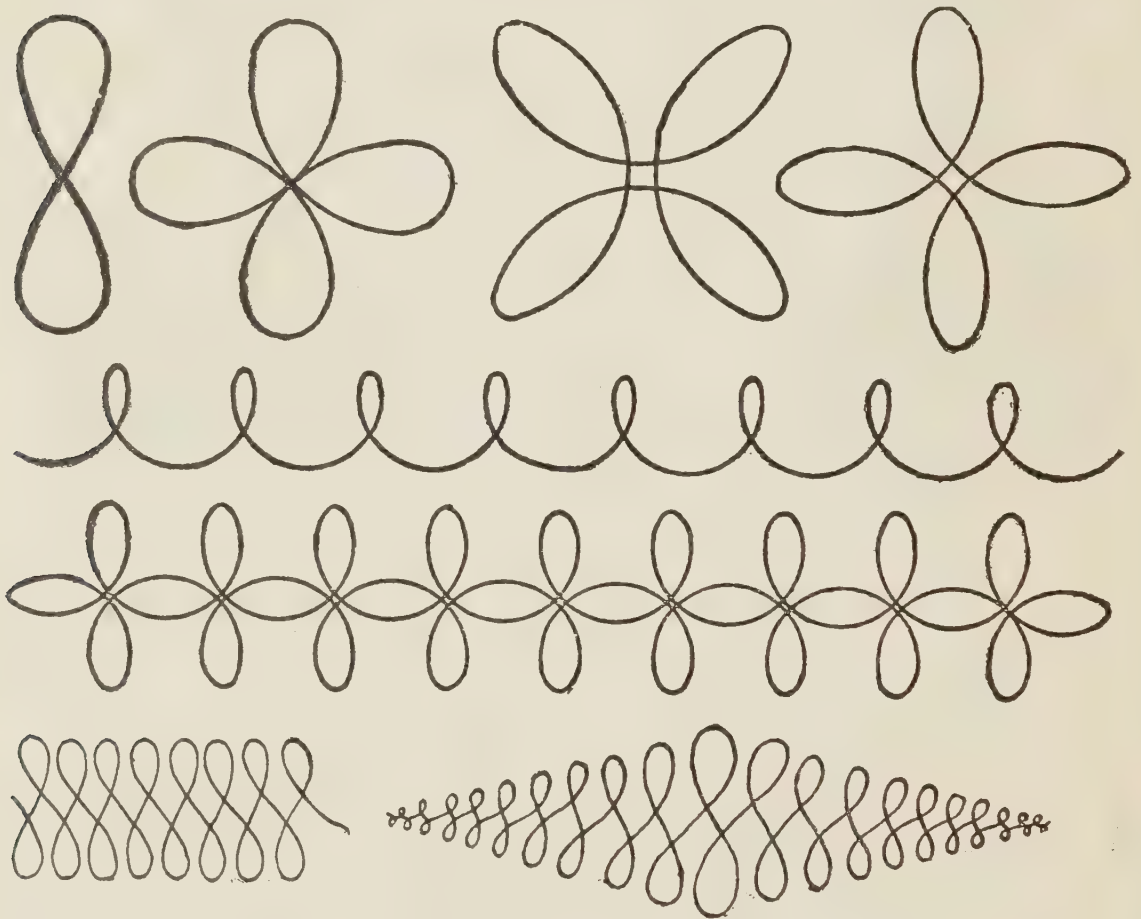


Fig. 41

common in constructing designs ; a little practice of this kind, however, taken each day, is an excellent means of acquiring facility in making compound curves.

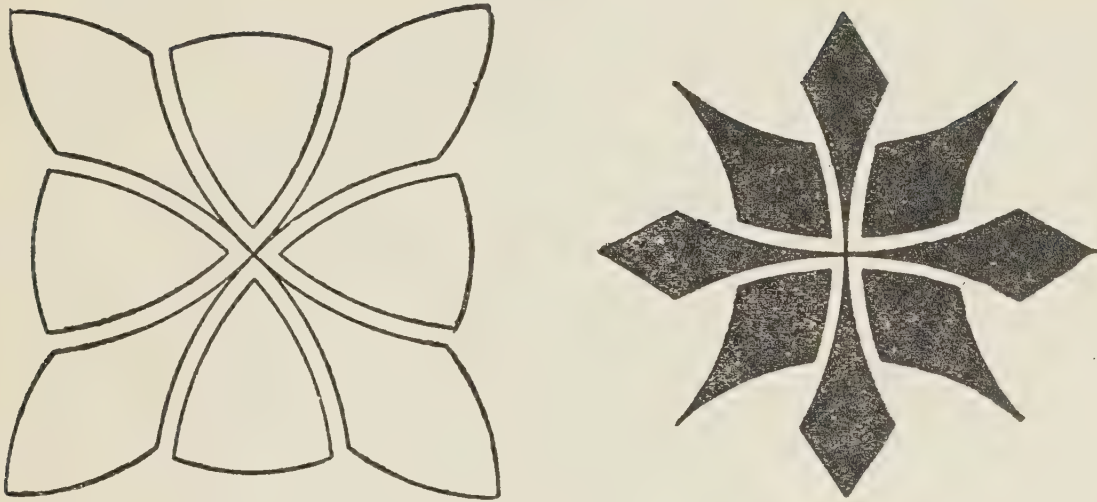
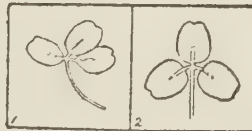


Fig. 42

15. Leaf Forms.

Besides what might be called artificial patterns or designs, many natural objects afford most excellent examples. These are often represented as *conventionalized*, that is, they are symmetrically drawn, all the minor points of detail being omitted.

Our illustration shows the clover leaf (1) As it appears in nature, and (2) As conventionalized.



To produce artistic work, endeavor to make all curves and their combinations have the appearance of freedom. This result is obtained only by constant practice.

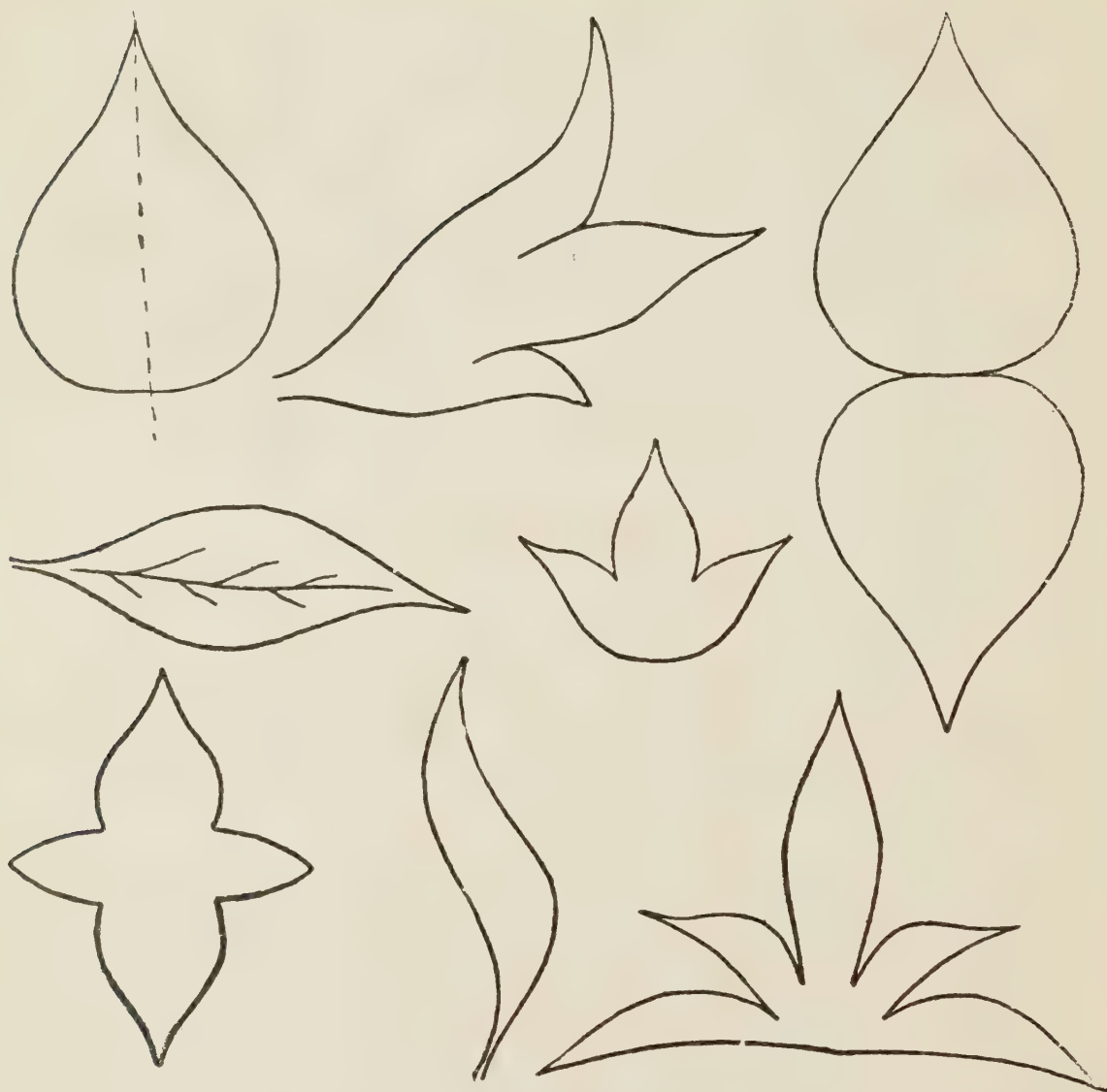


Fig. 43

Sometimes a pleasing effect is produced by drawing some of the parts in almost their natural form and making the whole design symmetrical, as in No. 1, 2, 3 and 4 of fig. 44. No. 5 shows the Lotus flower and No. 6 a compound leaf, both conventionalized.

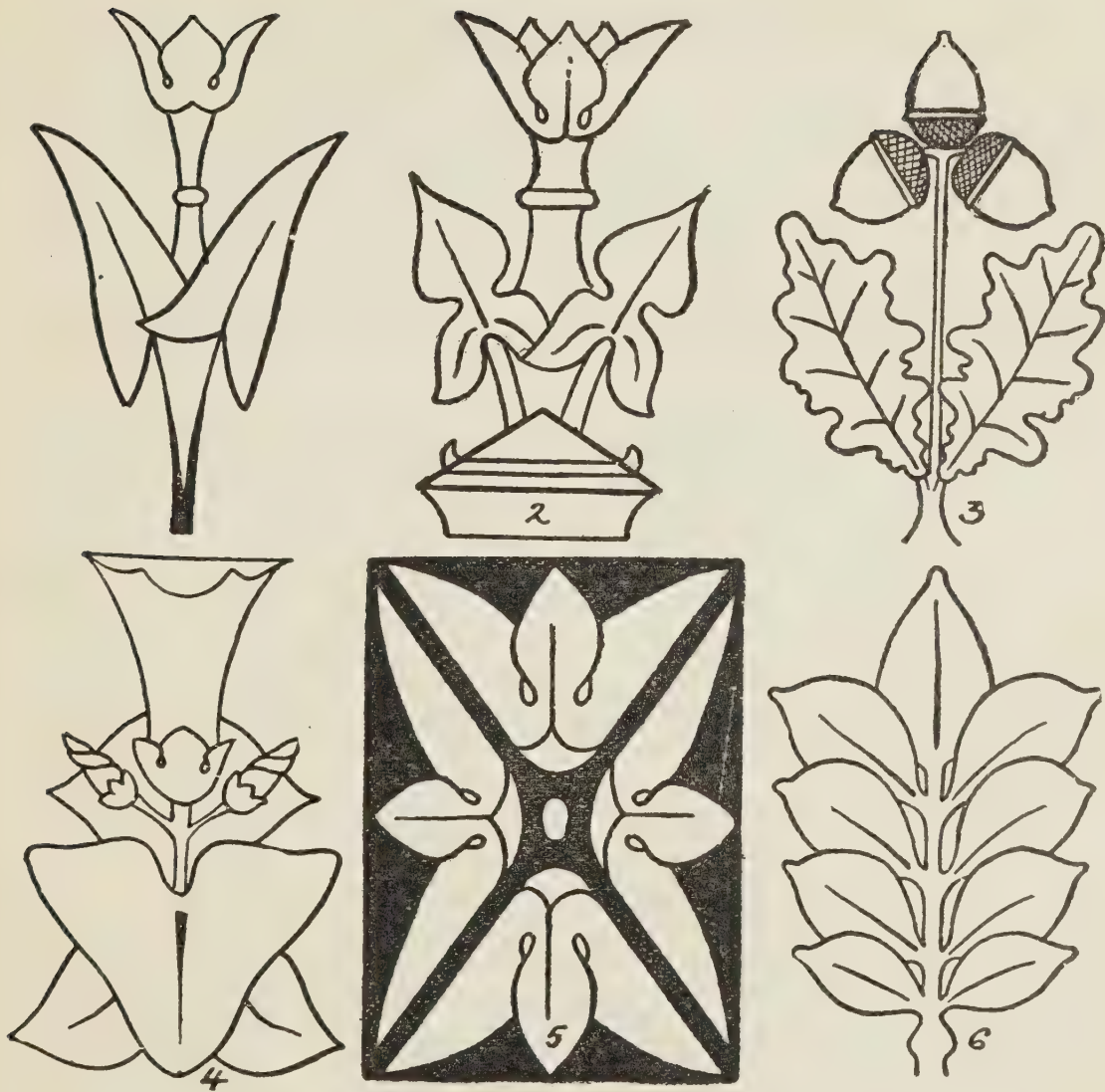


Fig. 44

Forms of this kind make very beautiful units for repetition in a border. These may be ornamented or the background filled in to give emphasis to the unit.

The use of flowers and leaves in design is almost universal. Sometimes, as we have said, these forms are conventionalized. Often, a design will better

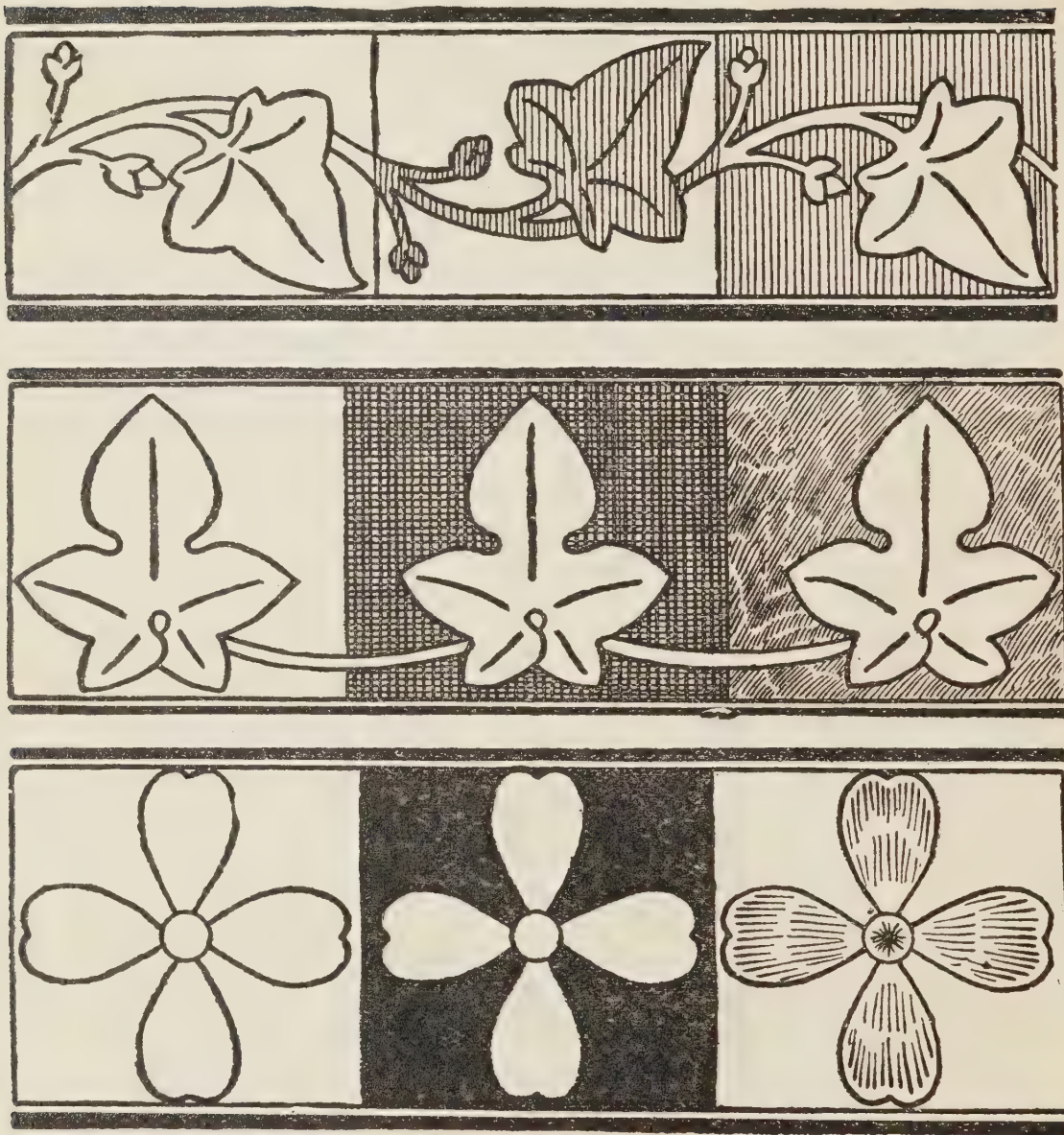


Fig. 45

suit the purpose for which it is intended, or it may be that a more artistic effect is produced by representing the flower or leaf ornament simply as we find it in nature.



Fig. 46

These illustrations will give some idea of the use of flowers or leaves

as suggested. Do not be content with merely copying designs of this kind but endeavor to invent others.

In the problems that follow draw from the flowers if samples are obtainable. If these are not obtainable substitute others.

Problems.

1. Draw an apple leaf (a) As it appears in nature, and (b) Conventionalized.

2. Draw a rectangle 1 in. x 6 in. and divide it into squares. In each square draw a maple leaf conventionalized and connect them by double curves.

3. Draw a rectangle 1 in. x 4 in. and ornament it with apple blossoms. Fill in the background.

4. Draw a circle about 3 in. in diameter. On the outside to the left outline a bunch of daisies and inside print MAY.

5. Draw a square and around the upper left hand corner a bunch of two or three dandelions. Print a suitable motto inside the square.

16. The Spiral.

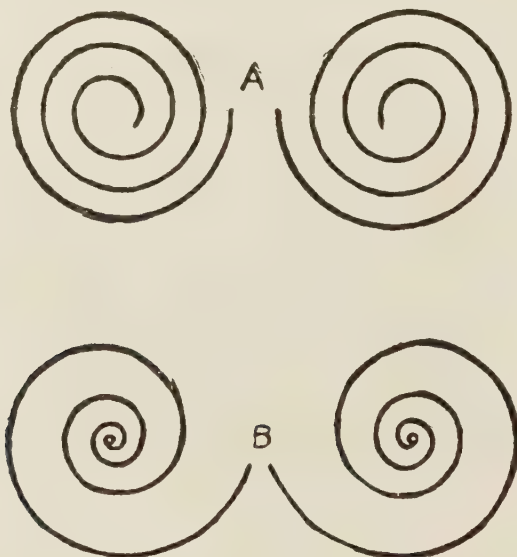


Fig. 47

There are two varieties of the compound curve called the spiral, as shown in our illustration. In A the distance between the lines remains practically the same ; in B the distance between the lines increases, being less nearest the centre.

The spiral is a most difficult curve to draw well and should be much practised. Do not try at first to make curves of any definite size.

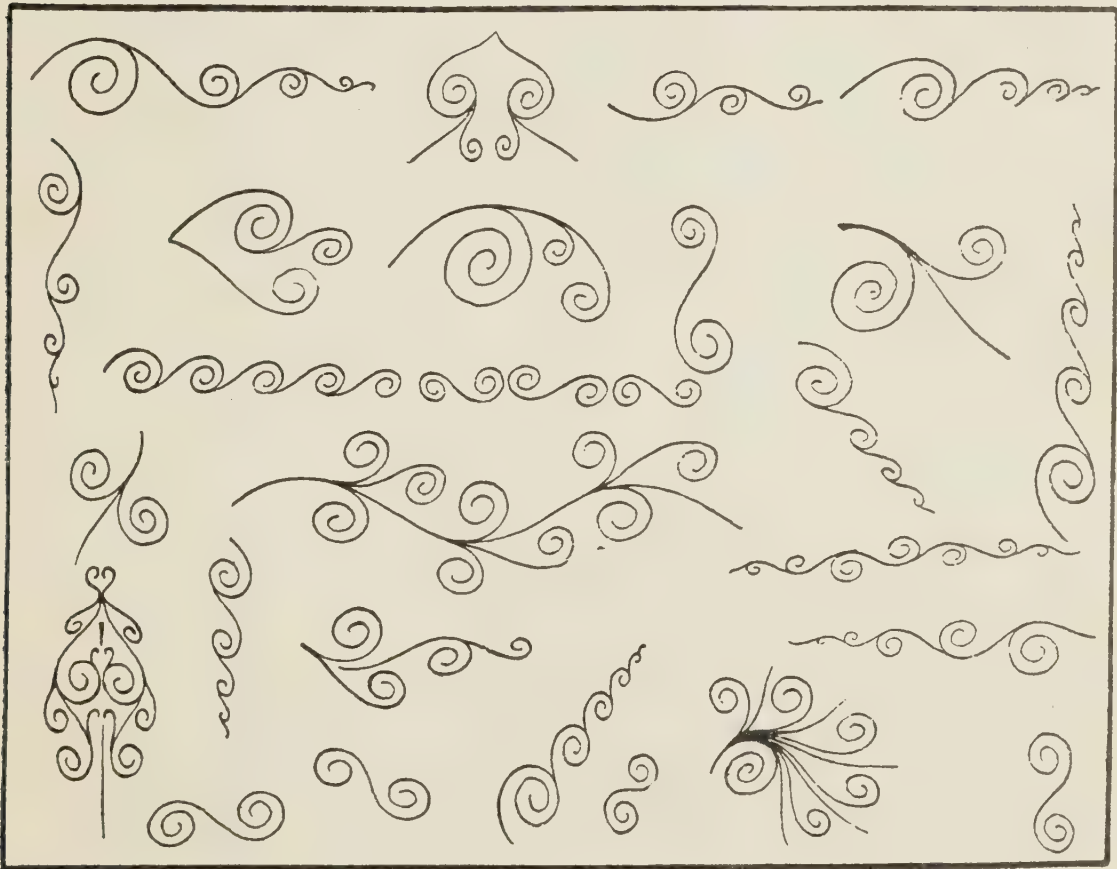


Fig. 48

Endeavor first to acquire *facility*, next *proportion*, and lastly *fitness*. A page of spiral practice might look something like this, which is a page of real

practice slightly reduced in size. Notice that the figures are not perfectly formed. Do not, therefore, copy the page, as it is submitted

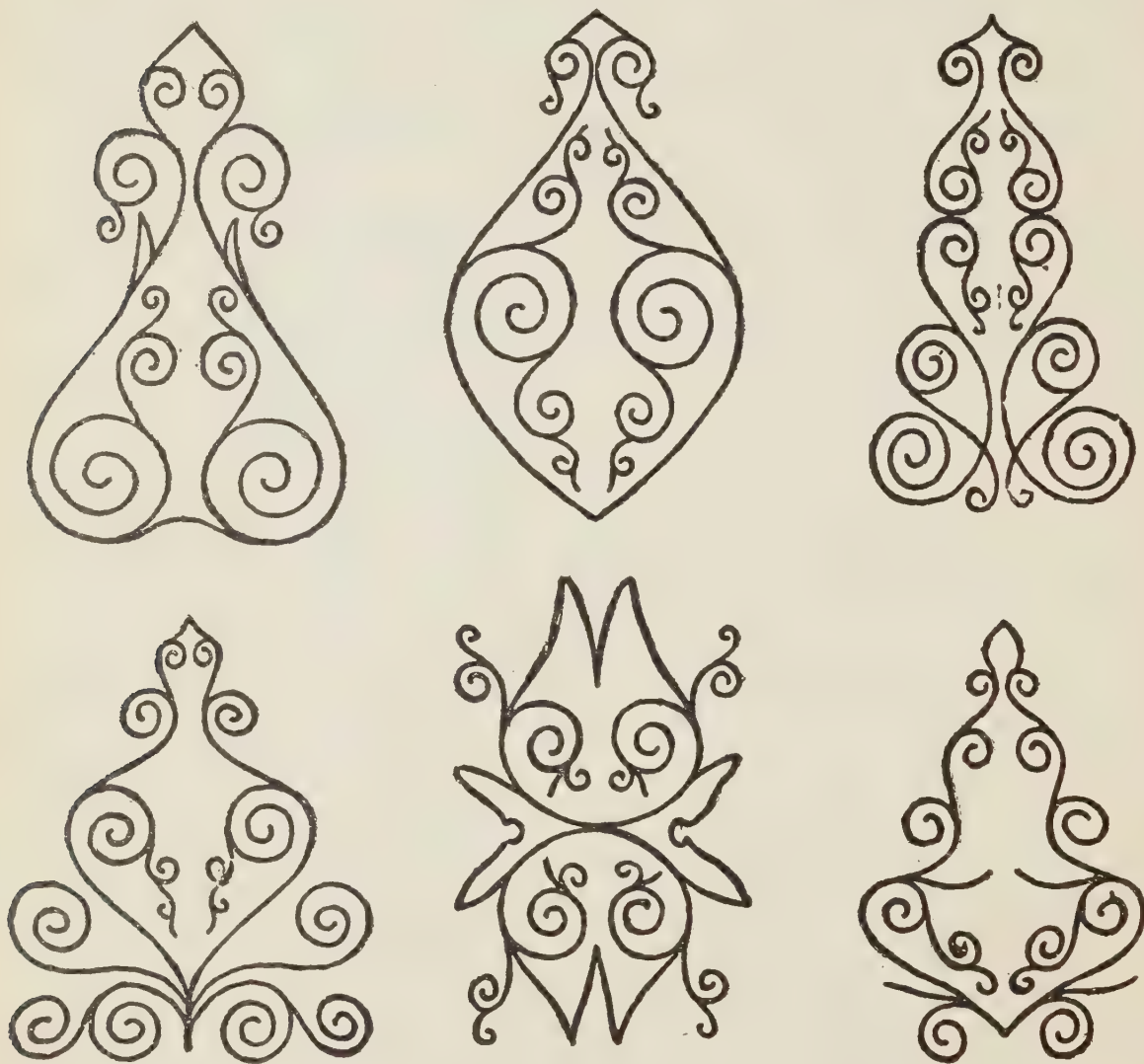


Fig. 49

merely as a suggestion. Keep the paper always in the same position during practice.

After some facility is gained give more attention to the proper proportion of the parts and also of the size of one curve as compared with another. To make the spiral *fit* a definite space will be the most difficult task.

A few examples are here given which will give some idea of the kind of practice that will be beneficial. Avoid making a dotted outline, but draw freely each spiral with one stroke of the pencil. In symmetrical designs be sure to build up each symmetrical part as we have before recommended.

Very pretty units for repetition may be made by modifying the spiral in many ways.

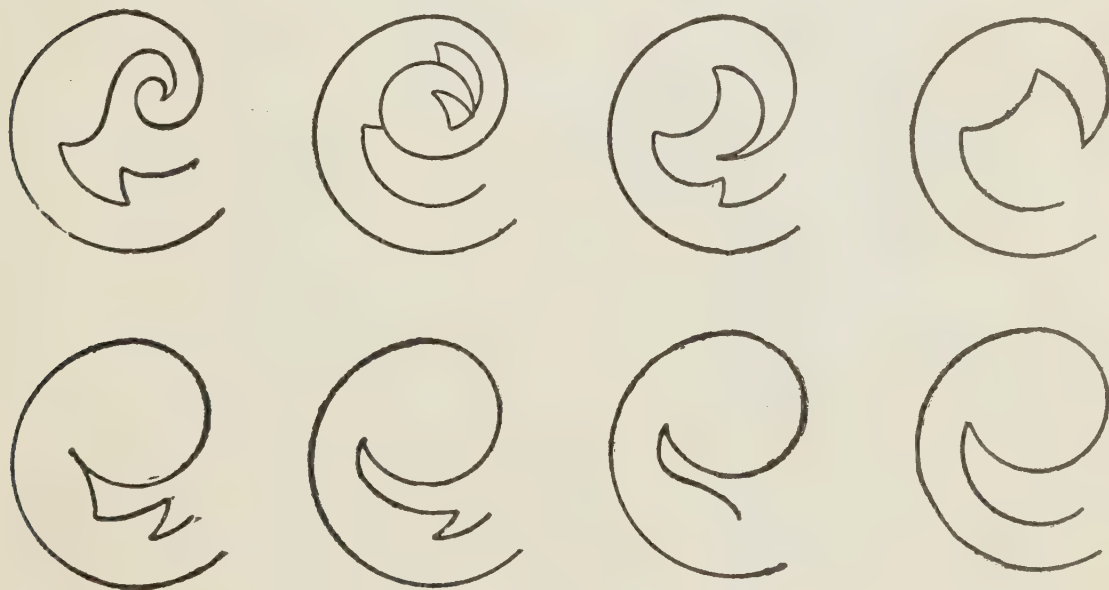


Fig. 50

Practice these by placing them in borders and designs. Invent others. The double spiral modified and used in combination with other

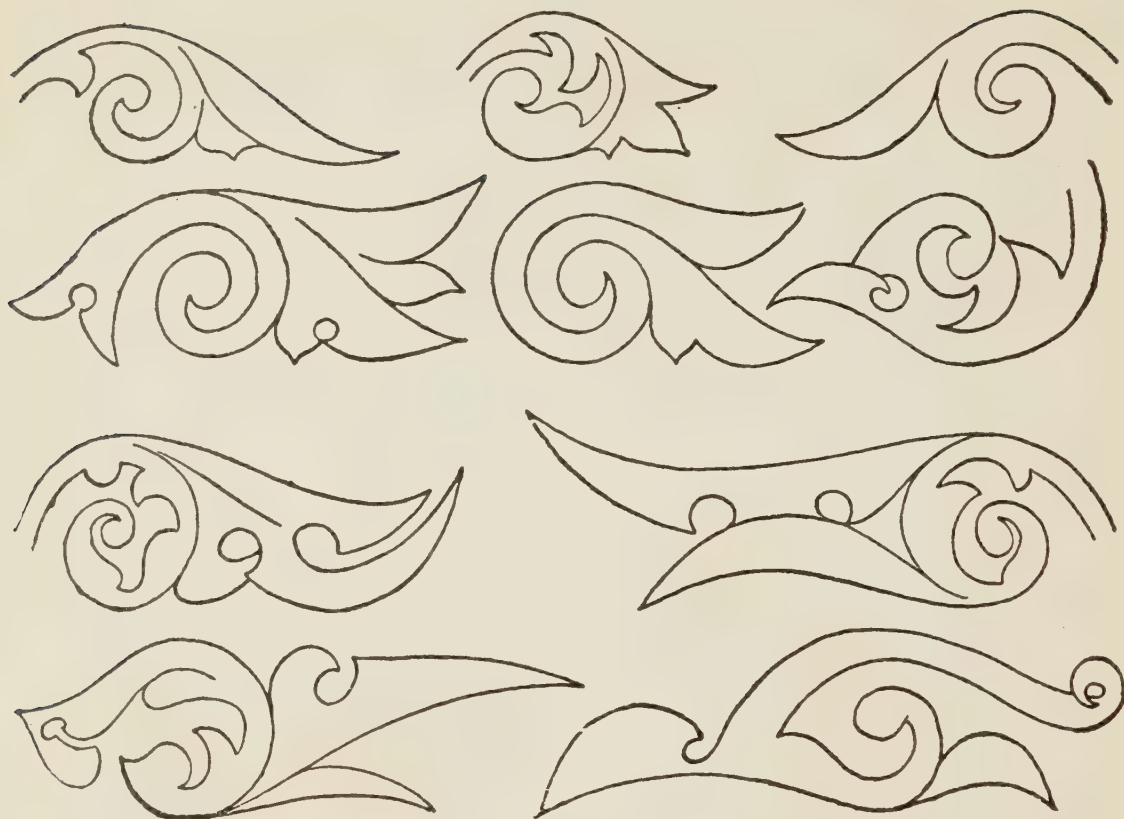


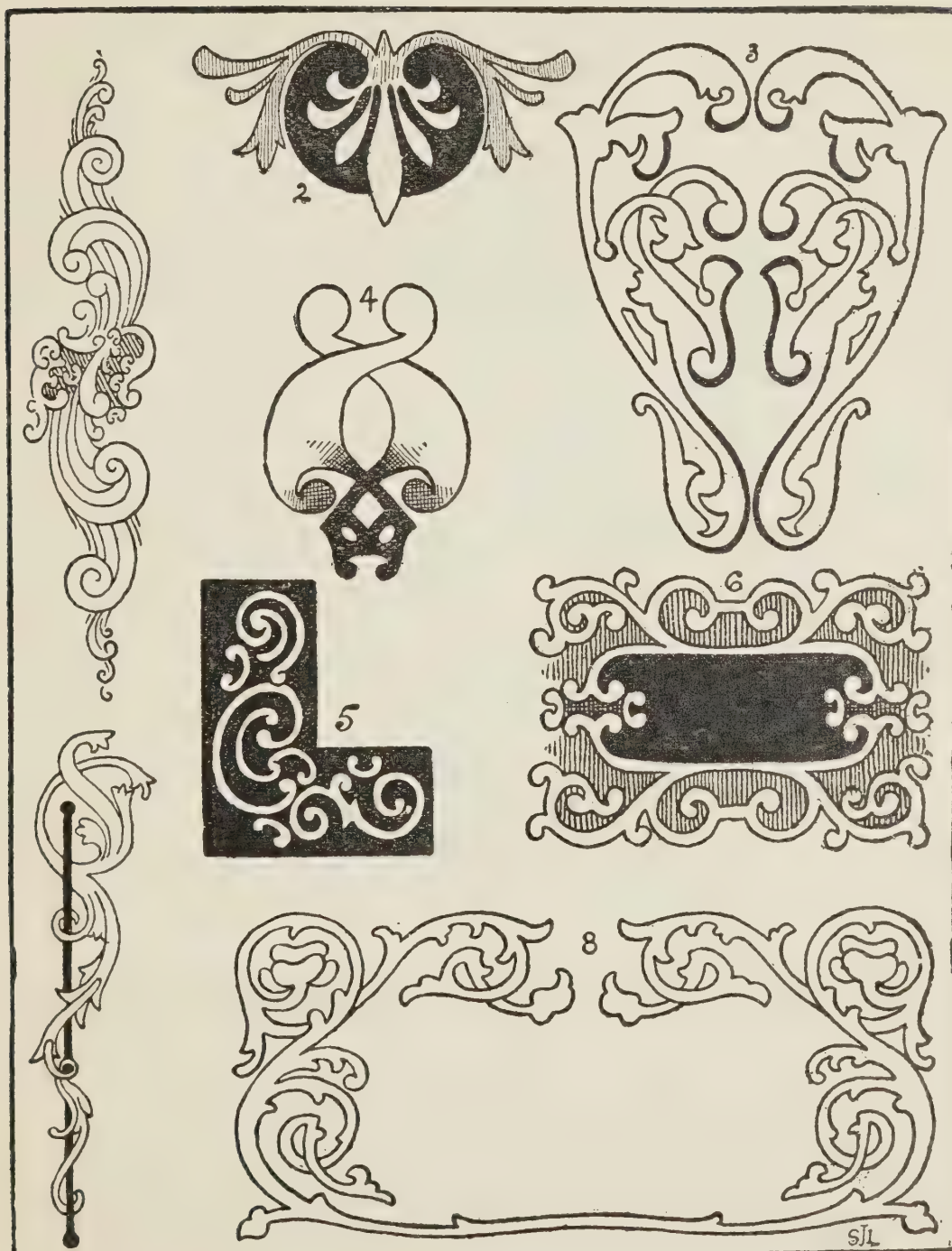
Fig. 51

compound curves will also make very pretty units.

A few spiral designs for practice are given on page 57. Others will be found under *Borders*.

17. Borders.

Border in its widest sense, the sense in which we shall use it, means that which is used to enclose a space. It may be made of any number of lines, straight or curved, ornamented or not according to the taste. It simply acts as a sort of picture frame, the purpose of which is to add contrast, value and compactness to the filling.



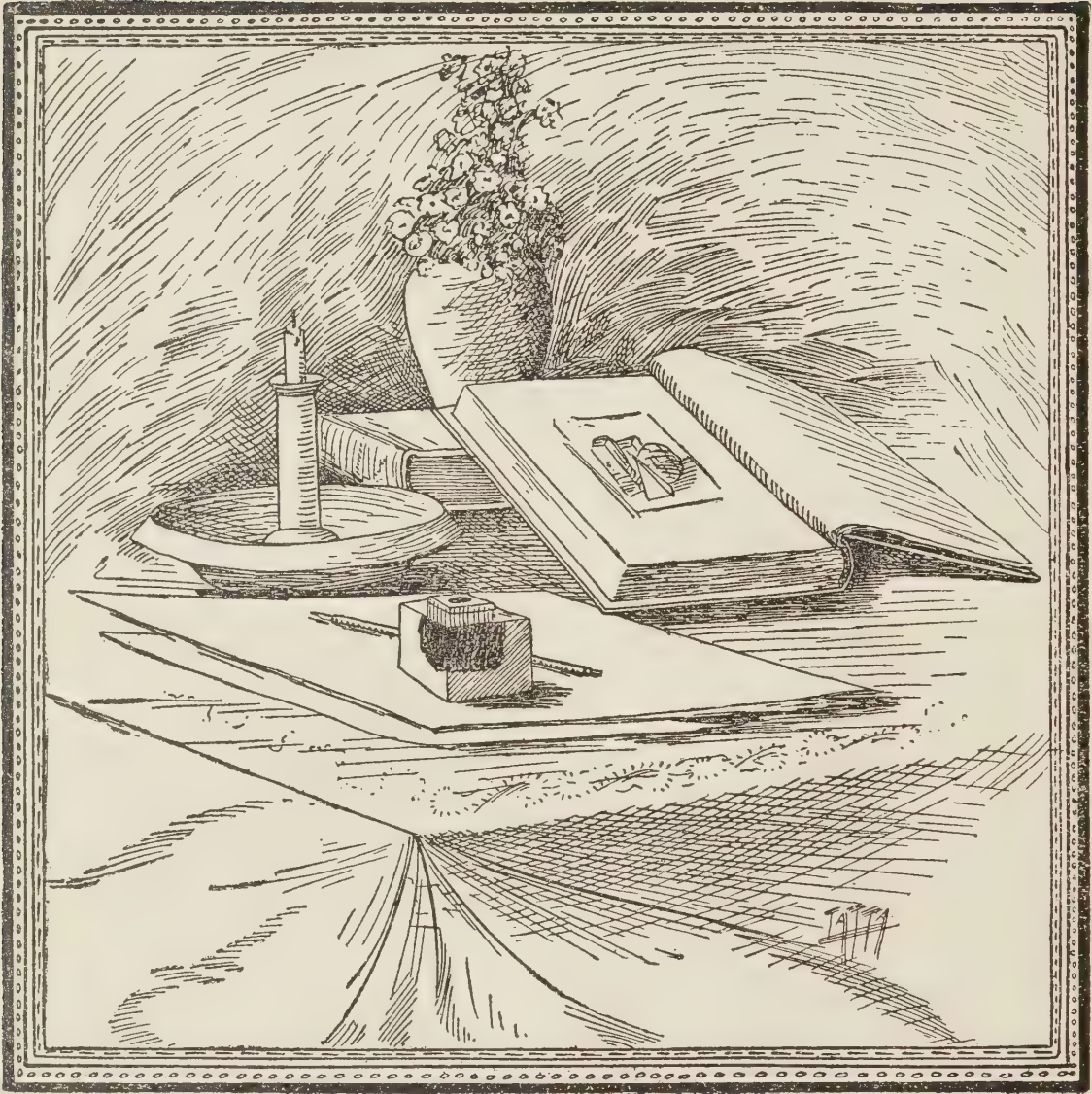


Fig. 52

In drawing and applying borders observe :

1. The design must be appropriate to that which it is proposed to enclose.
2. It must be adapted to the position in which it is generally seen.

If it is generally viewed horizontally it must be so drawn to be pleasing in that position ; if vertically it must be so designed to be pleasing in a vertical position ; if the purpose is for it to be seen in any position it must be further modified to appear at repose in any position.

The border must in fact be appropriate both to its application and position.

Parallel horizontal lines added above and below, to the right or left in nearly every case are necessary to produce the best effect.

Parallel Lines.

Probably the simplest as well as the most generally appropriate is made of parallel lines variously drawn. For examples of these see *The Drawing Book*.

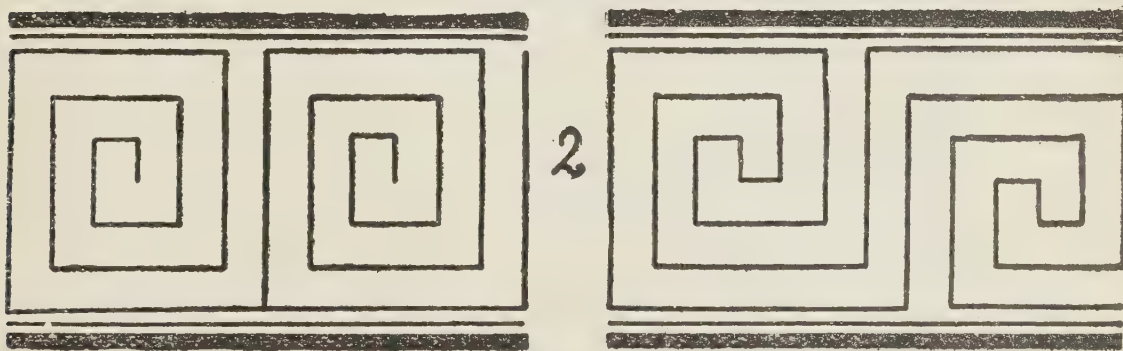


Fig. 53

The Greek Fret.

There are many varieties of this ornamental form. Its construction however is always by aid of intersecting straight lines. Curved lines it is true are sometimes used, yet the leading characteristics always remain the same. Architecture, textile fabrics, pottery, glassware, shoes, books, etc., abound in examples of this method of ornament.

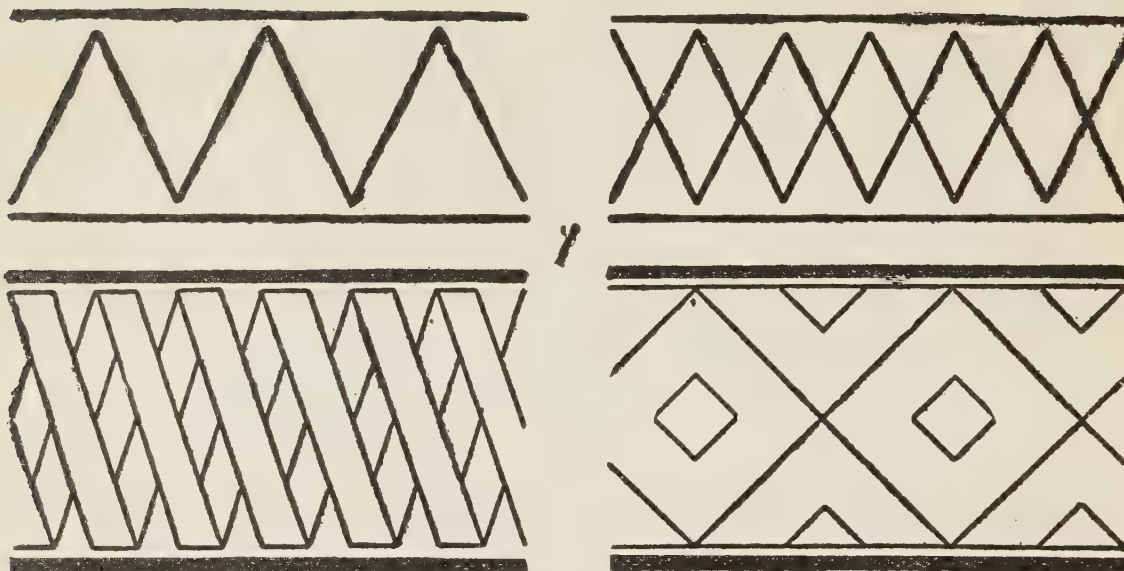


Fig. 54

The Zigzag

The zigzag is one of the oldest and, next to the parallel line border, the most generally used. It may be modified in many ways as shown in our illustration.

The Square.

The square as a unit is widely used. Examples may be seen in *The Square Tablet*.

The Circle.

See examples under *The Circular Tablet*.

The Triangle.

Be very careful in the use of the triangle. A few examples are shown in *The Triangular Tablet*.

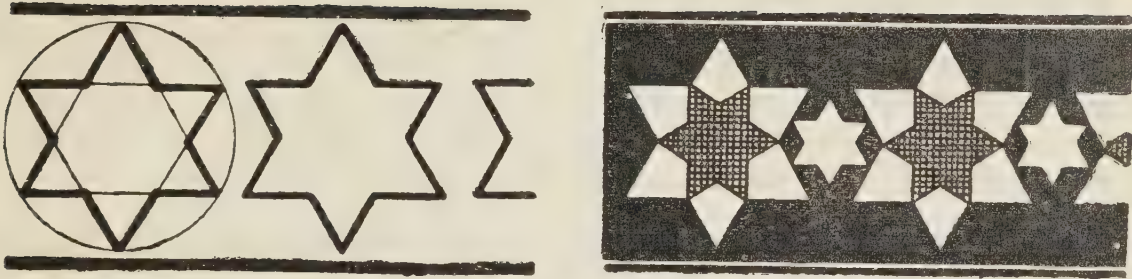


Fig. 55

The Star

The method of construction is shown in the first space of the illustration and requires no comment.

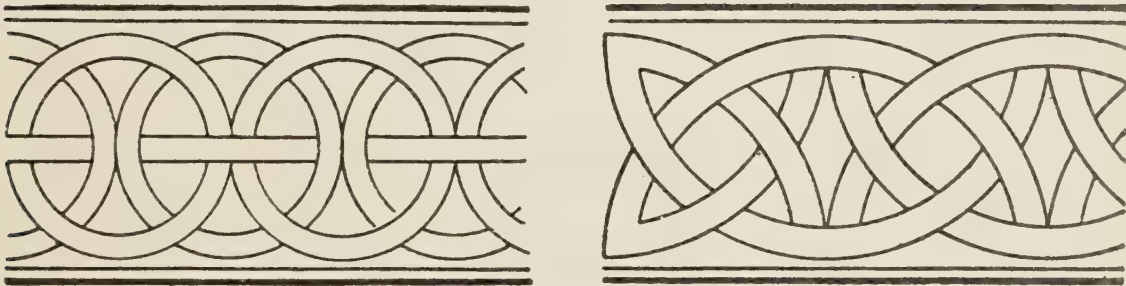


Fig. 56

Interlacing.

Triangles, squares and simple curves are shown in combination to give the appearance of parts passing in front of or behind each other. In drawing designs sketch the invisible as well as the visible portions. This will aid in getting the visible portions in proper proportion as well as in their right position. See fig. 18, page 27.

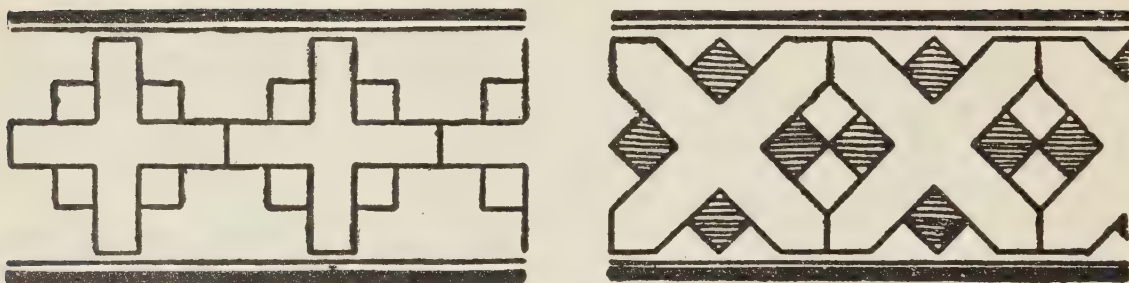


Fig. 57

The Cross and Square.

In the first part of our example the method of construction is shown.

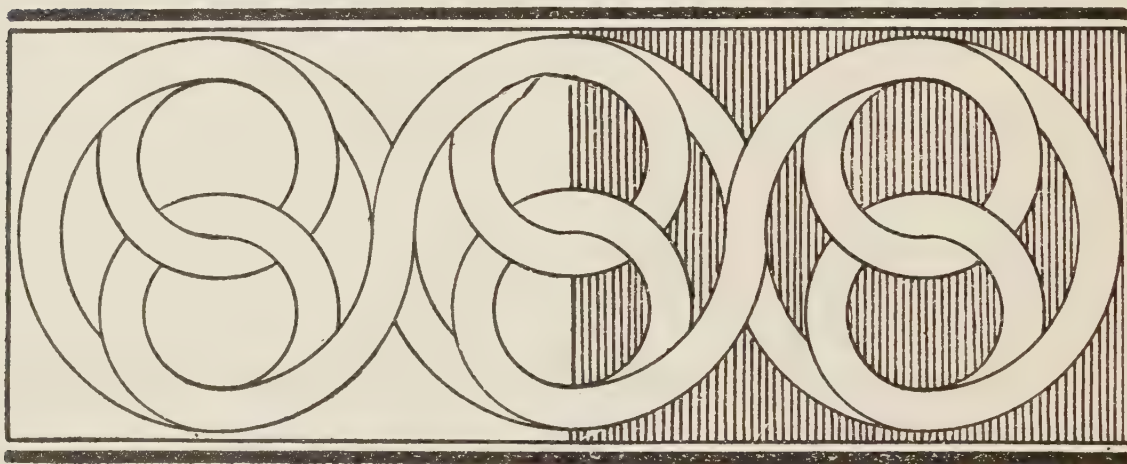


Fig. 58

Running Patterns.

The same principle will apply here as in the interlacing designs. Draw the invisible parts as well as the visible before lining in

Sketch means to draw in very light lines, preparatory to making the finished drawing.

Unit is a design repeated to form a larger design.

PART II.

MECHANICAL DRAWING AND ILLUSTRATION

In Mechanical Drawing the representation is made with the aid of instruments. The ruler, compass and trying square must be freely used.

Strive to attain absolute accuracy and neatness.

Adjust the ruler to the pencil, not the pencil to the ruler.

GEOMETRIC DRAWING

The use of the ruler or compass may not aid the hand to gain facility in the drawing of straight lines or circles. It will, however, give training in the general use of tools, a very necessary matter to be considered in the present day. Geometric drawing will give good practice along these lines and at the same time furnish a great many facts which may be put to practical use in constructive work.

1. A Point.

A *point* is used to mark position only. It has no size. For the sake of convenience we make a black dot (.) to indicate a point. The point, however, is not the whole of the dot, which has size, but merely its centre.

2. Lines.

A *line* has length only ; neither breadth nor thickness.

Lines are either *straight* or *curved*.

The ends of a line are *points*.

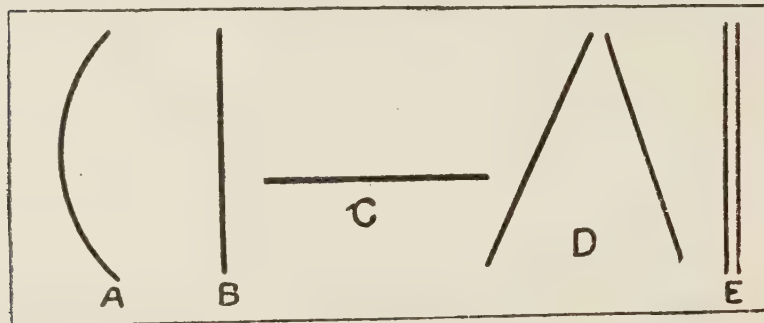


Fig. 59

A *straight line* is the shortest distance between two points. (B.)

A *curved line* is a line that changes its position at every point. (A.)

Straight lines may be classified as *horizontal*, *perpendicular*, or *oblique*.

Horizontal lines are drawn directly across the paper. (C.)

Vertical lines are drawn from the top towards the bottom. (B.)

Oblique lines are drawn slanting to the right or left. (D.)

Parallel lines are the same distance from each other throughout their entire length. (E.)

3. Surfaces.

Surfaces have length and breadth only. They have no thickness. Surfaces are enclosed or bounded by lines.

A *plane surface* is perfectly flat everywhere. The faces of a cube are plane surfaces.

A *curved surface* is like the rounded surface of a cylinder or a sphere.

According to their angles, triangles may be classified as *right-angled*, *obtuse-angled* or *acute-angled*.

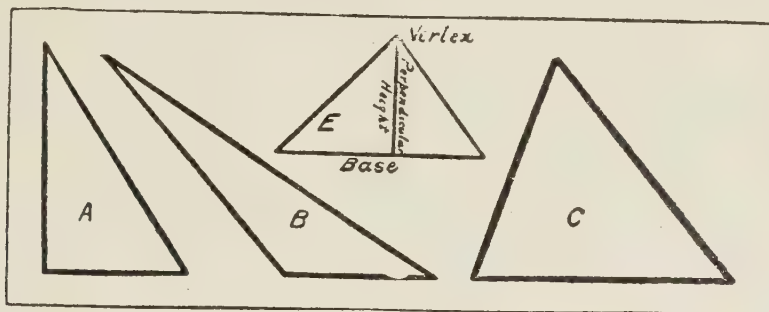


Fig. 62

A *right-angled* triangle has one right angle. (A.)

An *obtuse-angled* triangle has one obtuse angle. (B.)

An *acute angled* triangle has three acute angles (C.)

(E.) shows the base, vertex and perpendicular height. (P.H.)

6. Quadrilaterals.

A *quadri'ateral* is a figure enclosed by four straight lines.

A quadrilateral may be classified as a *parallelogram*, a *trapezium* or a *trapezoid*.

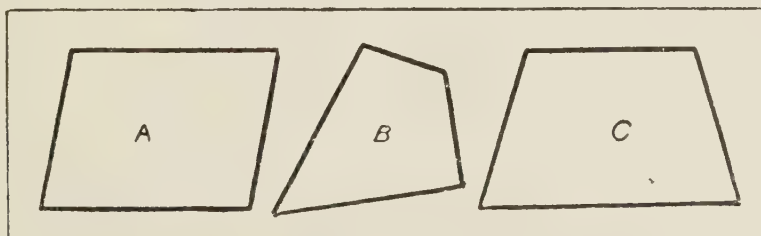


Fig. 63

A *parallelogram* is a quadrilateral having its opposite sides parallel. (A.)

A *trapezium* is a quadrilateral none of whose sides are parallel. (B.)

A *trapezoid* is a quadrilateral having only two of its sides parallel. (C.)

4. Angles.

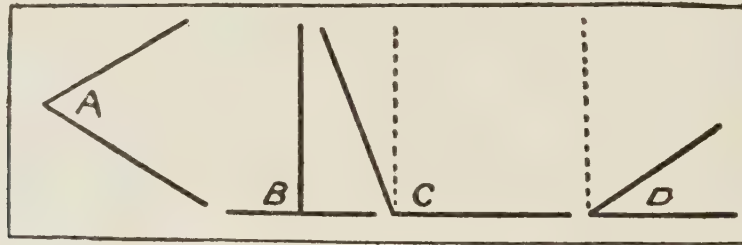


Fig. 60

An *angle* is the opening between two lines which meet at a point. (A.)

Angles may be classified as *right*, *obtuse* or *acute*.

When one straight line falls upon another straight line, and makes the angles on each side of it equal to each other, each of the angles is a right angle, and the line making these angles is a *perpendicular*. (B.)

An *obtuse* angle is greater than a right angle. (C.)

An *acute* angle is less than a right angle. (D.)

5. Triangles.

A *triangle* is a figure inclosed by three straight lines. According to their sides triangles may be classified as *equilateral*, *isosceles* or *scalene*.

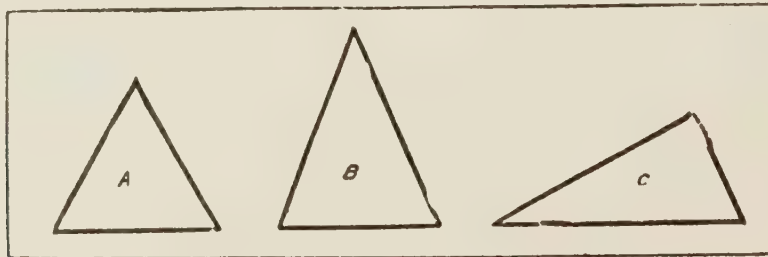


Fig. 61

An *equilateral* triangle has its three sides equal. (A.)

An *isosceles* triangle has two sides equal. (B.)

A *scalene* triangle has none of its sides equal. (C.)

A parallelogram may be classified as a *square*, a *rectangle*, a *rhombus*, or *rhomboid*.

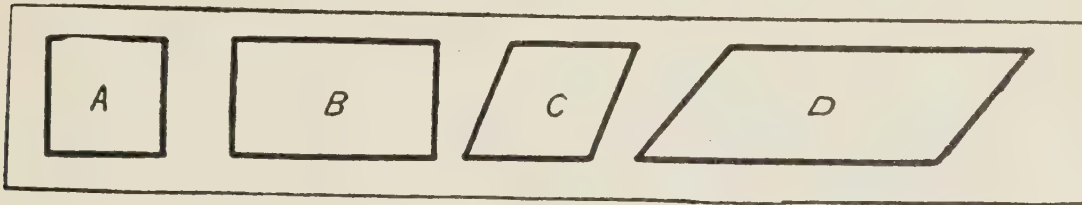


Fig. 64

A *square* is a parallelogram whose sides are equal and whose angles are right angles. (A.)

A *rectangle* is a parallelogram whose opposite sides only are equal, but whose angles are right angles. (B.)

A *rhombus* is a parallelogram whose four sides are equal, but whose angles are not right angles. (C.)

A *rhomboid* is a parallelogram whose opposite sides only are equal and whose angles are not right angles. (D.)

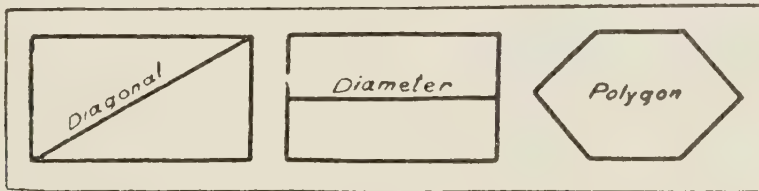


Fig. 65

The *diagonal* of a parallelogram is a line joining the opposite corners.

The *diameter* of a parallelogram is a line joining the middle points of opposite sides.

A *polygon* is a figure with more than four sides.

7. The Circle.

The *circle* is a figure enclosed by a curved line called the circumference, which is everywhere the same distance from a point called the *centre*. (A.)

The *radius* is a straight line drawn from the centre to the circumference.

The *diameter* is a straight line drawn through the centre and joining two opposite points in the circumference.

An *arc* is any part of the circumference.

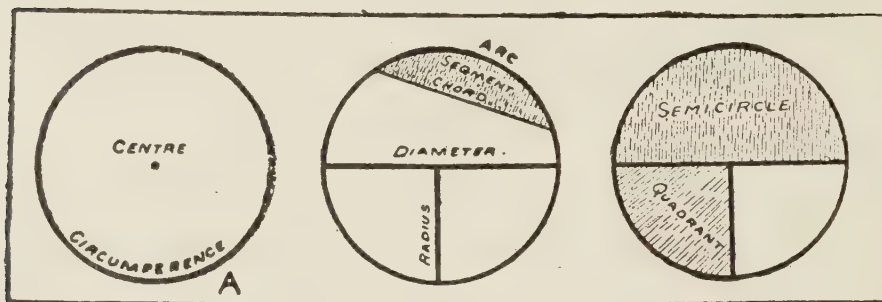


Fig. 66

A *chord* is a straight line joining the ends of an arc.

A *segment* is any part of a circle cut off by a chord.

A *semi-circle* is a half-circle.

A *quadrant* is a quarter circle.

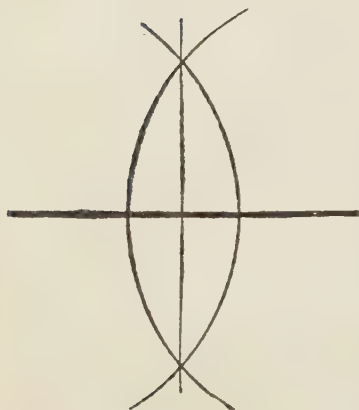


Fig. 67

8. Problems.

1. *Bisect a line, that is, divide it into two equal parts.*

From the ends of the line as centre with radii *greater* than half the line draw two arcs. A straight line joining the points where the arcs intersect will bisect the line.

2. *Draw a straight line perpendicular to a given straight line from a given point.*

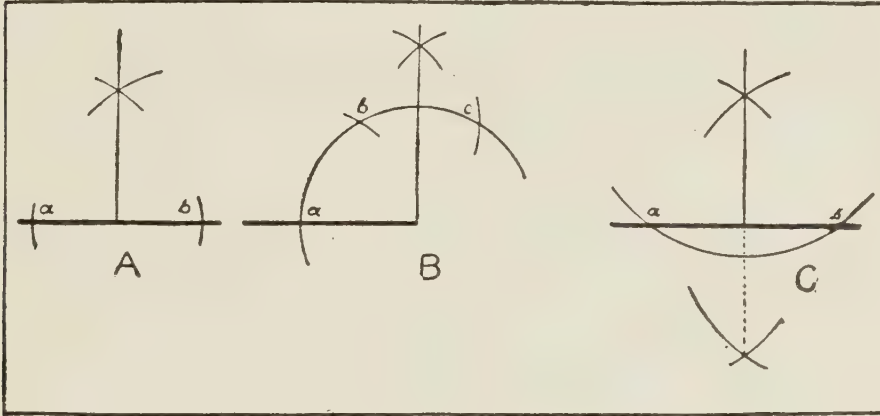


Fig. 68

A. If the point is in the line and near the middle ; from this point as centre with any radius cut the line at a and b . From a and b as centres draw intersecting arcs. A line drawn from the given point to the point of intersection will be perpendicular to the given line.

B. If the point is at the end of the line ; from this point as centre with any radius draw an arc cutting the line at a . From a with the same radius step off b and c , from b and c as centres draw intersecting arcs. A line drawn from the given point to the point of intersection will be perpendicular to the given line.

C. If the point is outside the line, from this point as centre draw an arc cutting the line at a and b ; from a and b as centres draw intersecting arcs. A line drawn from the given point to the points of intersection will be perpendicular to the given line.

3. *Draw a line parallel to a given line.*

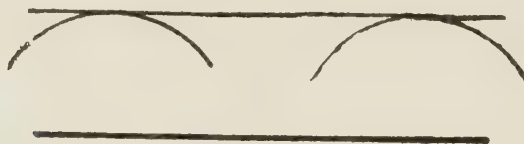


Fig. 69

From any two points in the given line, with the distance you require the lines to be apart, draw two arcs. A line drawn touching these arcs will be parallel to the given line.

4. *Draw an angle equal to a given angle.*



Fig. 70

Let a be the given angle. From a as centre draw an arc cutting the lines of the angle at b and c . Draw one of the lines which will help to form the angle. From the end of this line as centre with the same distance draw an arc cutting the line at d . Mark $d e$ equal to $b c$. The other line completing the angle will be drawn through e .

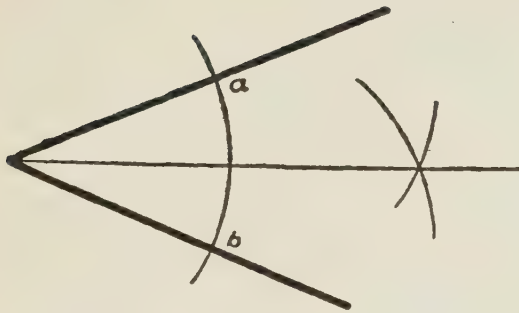


Fig. 71

5. *Bisect an angle.*

From the point where the lines meet as centre draw an arc cutting the lines at *a* and *b*. From *a* and *b* as centres draw intersecting arcs. A line drawn from the point of intersection to the point where the lines meet to form the angle will bisect the angle.



Fig. 72

6. *Draw an equilateral triangle.*

Draw one of the sides. From the ends of this side as centres with radii equal to the length of this side draw intersecting arcs. Draw the other sides from the point of intersection to the ends of the first side.

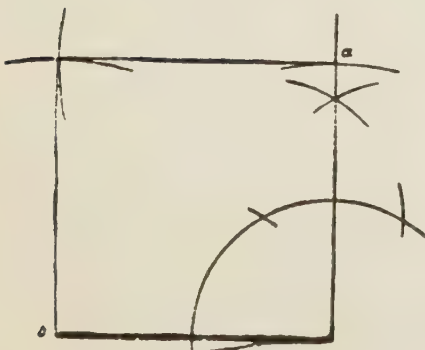


Fig. 73

7. *Draw a square.*

Draw one side. From the end of this side erect a perpendicular. From this end as centre with radius equal to the side already drawn, draw an arc cutting the perpendicular at *a*. From the centres *a* and *b* with the same radius draw intersecting arcs. The other sides will be drawn from the point of intersection.

8. *Draw an oblong or rectangle.*

The method is the same as that of the square.

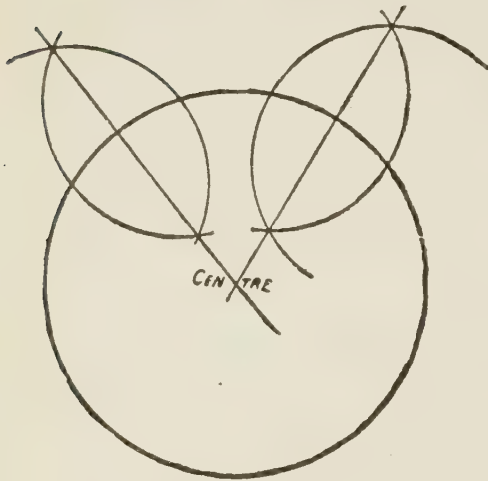


Fig. 74

9. *Find the centre of the circle.*

From any two points with any radius draw arcs intersecting on both sides of the circumference. Join the points of intersection. From any other two points as centres draw intersecting arcs in the same manner as before. Join the points of intersection. These two lines if produced will meet at the centre of the circle.

10. Draw a line $4\frac{5}{8}$ inches long and erect a perpendicular 2 inches from the end.

11. Draw a line 4 inches long and bisect it. Test your work with the ruler.

12. Draw a line 4 inches long and divide it into four equal parts.

13. Draw a triangle the sides of which are 2, 3 and 4 inches.

14. Draw a square the sides of which are $3\frac{1}{4}$ inches.

15. Draw an angle and bisect it. Draw another angle $1\frac{1}{2}$ times as large.

16. Draw a rectangle; length 2 in., width 1 inch.

17. Draw a triangle; bisect each side; join points of bisection by straight lines.

18. Bisect the angles of a triangle and produce the bisecting lines till they meet in a point.

19. Draw a square; bisect each side; join the points of bisection to form four smaller squares.

20. Divide a line into four equal parts.

9. Degrees.

Every circle is supposed to be divided into 360 equal parts, each part being called a degree ($^{\circ}$). This unit, degree, is used to measure angles. Every arc of every semi-circle contains 180° and every arc of every quadrant 90° .

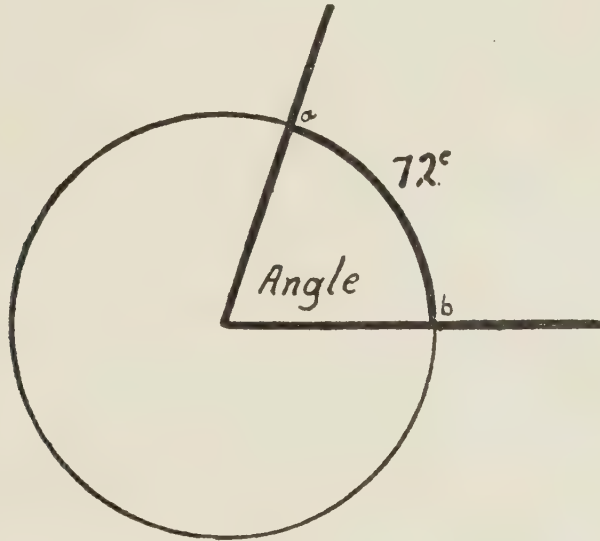


Fig. 75

When two straight lines form an angle, this angle is measured in the following manner: From the angular point as centre strike an arc cutting the straight lines as in Fig. 75. The angle is said to contain as many degrees as there are degrees in the arc $a b$. Thus if this arc is one-fifth of the whole circle, the angle is said to be an angle of 72° , because one-fifth of 360 (the number of degrees in a whole circle) is 72.

10. Problems.

1. How many degrees in a right angle?
2. Bisect a right angle. How many degrees in the angles thus formed?
3. Draw an angle of 135° .
4. How many degrees in an angle four of which will make a right angle?
5. Draw an angle of $67\frac{1}{2}^{\circ}$.

NOTE—An instrument for measuring angles is called a *protractor*.

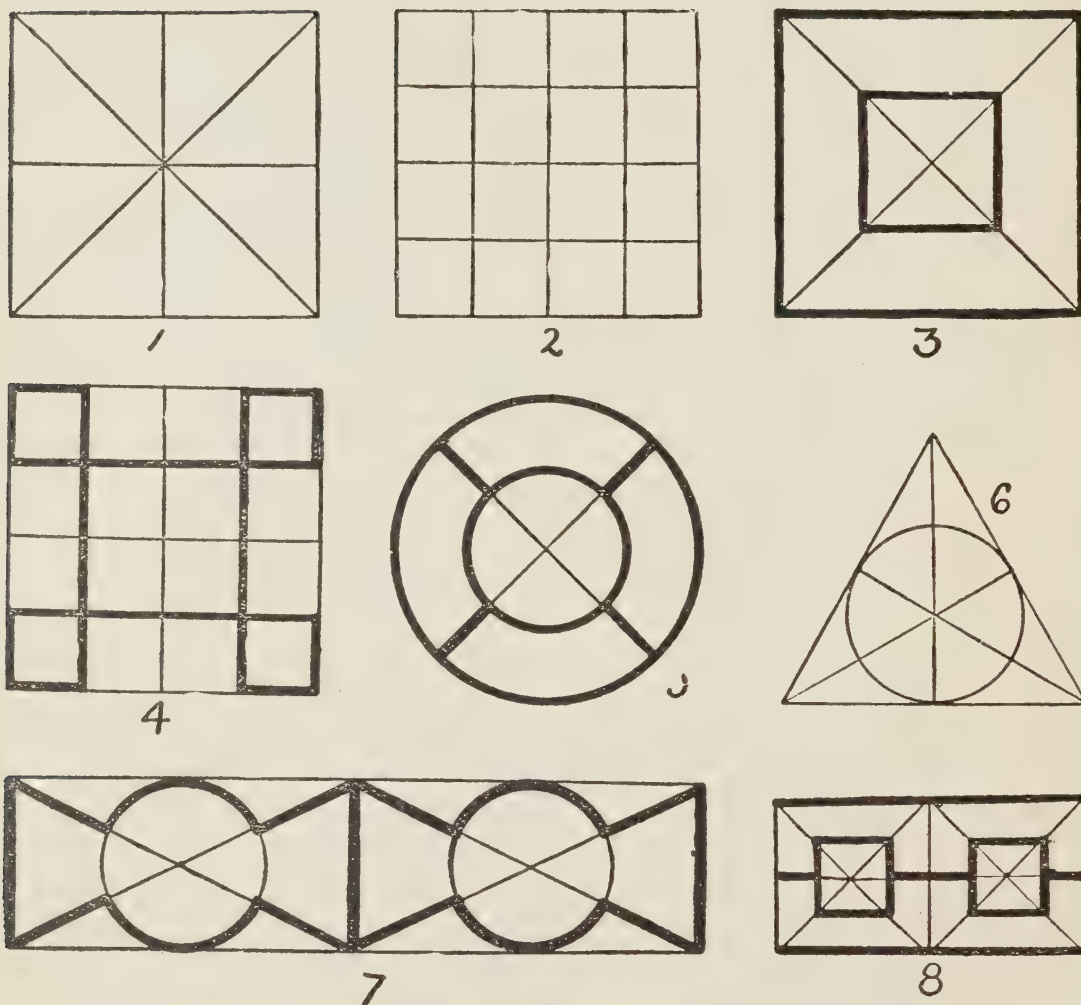


Fig. 76

DICTATION DRAWING.

It has been said that comparatively few persons are able to describe accurately what they have seen. Experience proves, that, in the schoolroom at least, this is largely true. All seem to have general impressions, which, when tested are variously vague and inaccurate.

Dictation Drawing will not only tend to develop accurate observation but accurate expression of what is seen. It will also help to fix permanently upon the mind the proper application and significance of the terms made use of in this work, and, as an exercise in dictation, descriptive writing of designs already drawn will be excellent practice, cultivating the use of terse and accurate language.

Review the terms used in *Geometric Drawing*. Strive to become familiar with the terms : point ; line—straight and curve, horizontal, oblique, vertical, parallel and perpendicular ; angle—right, obtuse and acute ; triangle—equilateral, isosceles and scalene, right-angled, obtuse-angled, and acute-angled ; square, rectangle, diagonal and diameter ; circle, radius, diameter, arc, chord, segment, semi-circle and quadrant ; bisect and trisect.

The prefix *semi* used in connection with diagonal, diameter, etc., means half-diagonal, half-diameter, etc.

Artificial objects having geometric forms are best suited to begin with.

As a preliminary exercise, make careful examination and written descriptions of a few designs. For example fig. 77 would be the result of the following:

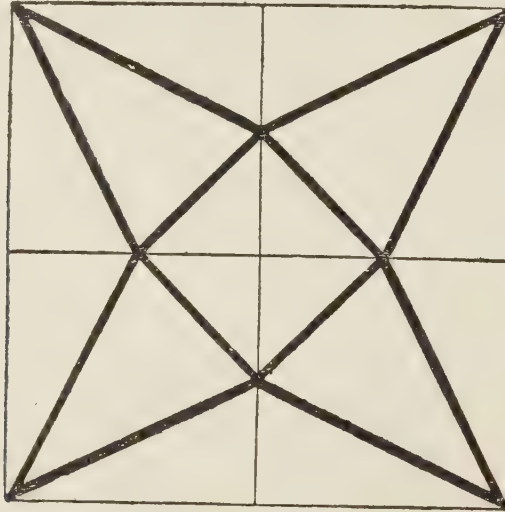


Fig. 77

Draw a square, two sides vertical; its diameters. Bisect the semi-diameters. Join points of bisection to form a smaller square; each corner of the larger square with the nearest corners of the smaller square. Line in all oblique lines to form a four-pointed star.

In joining points, unless the contrary is stated, a straight line is understood to be used.

Write a descriptive outline of each of the figures in fig. 76.

It is not necessary that all should be written before beginning to draw. A good exercise is to write a description of one, close the book, draw from your description and compare with the original.

Although we have placed this department with *Mechanical Drawing* it will also afford excellent freehand practice.

1. Problems.

1. Draw a square. Trisect each side. Join the points of trisection by vertical and horizontal lines to form nine smaller squares. Line in the inner sides of each corner square and the outer side of each central square of each side to form a cross.

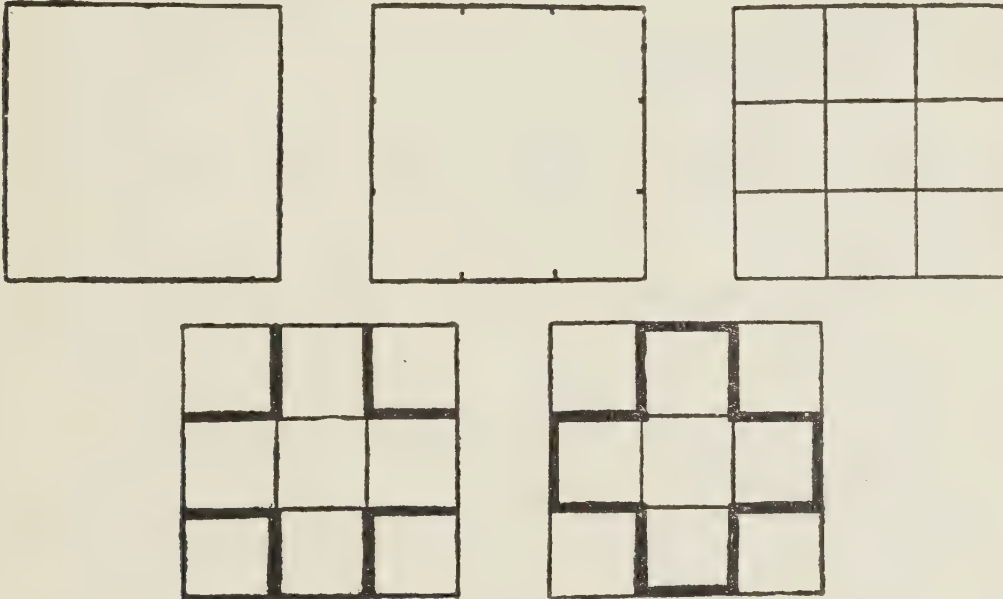


Fig. 78

The constructive sketch should be made very light so that when "lining in" is done the figure will be plainly seen.

Fig. 78 shows the progress of the work, step by step.

2. Draw a square and its diameters. Join the ends of the diameters to form another square. Line in the squares.

3. Draw a square and its diagonals. Bisect each semi-diagonal and join the points of bisection to form a smaller square. Line in both squares.

4. Draw a circle; two diameters cutting each other at right angles. Bisect each semi-diameter. Through the points of bisection draw a smaller circle. Line in both circles.

5. Draw a rectangle and its horizontal diameter. Divide this diameter into four equal parts. Through each point of division draw a vertical line terminating at the sides of the rectangle. Line in the horizontal diameter and all vertical lines.

6. Draw a square. Trisect each side. Draw vertical and horizontal lines connecting the points of trisection to divide the square into nine smaller squares. Draw the diagonals of the centre square. Line in the corner squares and the diagonals.

7. Draw a square. Divide it into nine smaller squares. Bisect each side of the large square. Draw simple curves concave () to each other, joining the points of bisection with the two nearest corners of the centre square. Line in the curves.

8. Draw a square. Divide it into nine smaller squares. Bisect each side of the centre square. Connect each corner of the largest square with the two nearest points of bisection by simple curves concave to each other. Line in the curves.

9. Draw a square and divide it into nine smaller squares. Bisect each side of the larger square. Connect each point of bisection with the two nearest corners of the centre square by simple curves, concave to each other. Draw the diagonals of the central square ; a small circle having for its centre the centre of the inner square. Line in the circle, curves and those parts of the diagonals outside of the circle.

10. Draw a square and divide it into nine smaller squares ; the diagonals of the central squares of each side. From the points of intersection of the diagonals as centres draw small circles. Line in the outer sides of each corner square, the circles, and those parts of the diagonals outside of the circles.

11. Draw a square and its diameters. Join the ends of the diameters to form a smaller square. From the centre of the squares as centre, construct a small circle. Trisect each side of the smaller square, and connect the corners of the large square with the two nearest points of trisection by simple curves concave to each other. Line in the circle, curves, smaller square

and those parts of the diameters of the large square which are outside the circle.

12. Draw a square and divide it into nine smaller squares. Draw simple curves on the inside of each side of the central square. Line in the curves and the corner squares

13. Draw three concentric squares (squares having the same centre), sides parallel. Draw their diagonals and diameters. Line in the squares, those parts of the diagonals between the two outer squares and those parts of the diameters between the two inner squares.

14. Draw a square and divide it into sixteen smaller squares. Shade by horizontal parallel lines all the outside squares, except the corner ones. Line in the boundary lines of the shaded parts.

15. Draw a square. Bisect each side. From the points of bisection as centres construct small circles. Join the points of bisection to form a smaller square. Draw the diameters of the smaller square. Bisect the semi-diameters. Join the points of bisection to form a still smaller square. Shade the smallest square and those parts of the largest square outside of the circles and the medium square. Line in all the sides of the squares which are outside of the circles, the circles and those parts of the diameters which are outside of the smallest squares.

16. Draw an equilateral triangle. Bisect each side. From the points of bisection as centre construct small circles. Join the points of bisection to form another triangle. Line in the circles and all straight lines which are outside of the circles.

17. Draw a rectangle, longest sides vertical. Bisect the longest sides. Draw on each side an ogee curve, curving in at the top and cutting the side at the point of bisection. Line in the curves and the horizontal sides of the rectangle.

18. Draw a square about 6 in. a side. Divide it into thirty-six small squares. Draw the diagonals of any one of the small squares. On each semi-diagonal draw two simple curves concave to each other. Line in the curves and repeat the design in each of the other squares.

19. Draw a square and divide it into nine smaller squares. Draw the diagonals of the central square on each side. From the points of intersection of the diagonals as centres, construct circles having their diameters equal to the diagonals of the squares. Line in the outer sides of the corner squares, and those parts of the circumference of the circles falling within the larger square. Shade those parts of the larger square which are outside of the circles.

20. Draw a horizontal line about 4 in. long and divide it into four equal parts. Draw two simple curves on the horizontal line concave to each other. On each of the two inside parts of the horizontal line as a base, construct equal isosceles triangles on each side, having their vertices outside of the curves. Line in those parts of the curves which are outside of the triangles and those parts of the triangles which are outside of the curves.

21. Draw a circle; three diameters, cutting the circumference into six equal arcs; a simple curve on each side of each semi-diameter. Line in the curves.

22. Draw two concentric circles; two diameters of the larger circle, cutting each other at right angles. On one of the semi-diameters of the smaller circle construct an ogee curve. Draw a similar curve on each of the other semi-diameters. Line in the circles and the curves.

23. Draw a circle. Divide the circumference into six equal arcs. Draw the cord of each arc and a radius from the end of each cord. Line in all straight lines.

24. Draw two equal and opposite isosceles triangles having a common horizontal base. Bisect each of the equal sides, and join the points of bisection by horizontal and vertical lines. Construct equal simple curves, touching each other, on the inside of the vertical lines. Line in the curves and those halves of the equal sides forming the vertical angles.

After working out the foregoing problems, or others of a similar nature, practice problems in which the figures are of definite size.

25. Draw a rectangle 6 in. by 1 in. and divide it into six squares. Draw the diagonals of each square. Bisect each semi-diagonal and join the

points of bisection to form smaller squares. Line in the rectangle, the smaller squares and those parts of the diagonals which are outside of the smaller squares.

26. Draw a square the sides of which are 3 in. ; its diagonals. From the point of intersection of the diagonals as centre, construct a circle having a radius of one inch. Line in the square and the circle.

27. Draw an equilateral triangle the sides of which are two inches long. Bisect each side and join each point of bisection with the opposite angle. From the point of intersection of these lines as centre construct a circle 2 in. in diameter. Line in those parts of the circle which are outside of the triangle and those parts of the triangle which are outside of the circle.

28. Draw a circle 3 in. in diameter ; two diameters at right angles to each other. Bisect each semi-diameter and from the points of bisection as centres, construct circles three-quarters of an inch in radius. Line in that part of the circumference of each small circle, which is outside of the others.

29. Draw a rectangle 4 in. by 1 in., longer sides vertical ; a horizontal line cutting the vertical sides one inch from the bottom and projecting a half an inch to the right and left. Mark a point on each vertical side one inch from the top. On each vertical side construct an ogee curve, curving in at the top, cutting the vertical side at the marked point and touching the end of the longest horizontal line. Line in the curves and all horizontal lines.

30. Draw two horizontal lines, each 5 in. long and one inch apart, so that their ends may be connected by vertical lines. Jo'in the ends by vertical lines. Divide the figure thus formed into five squares. Draw the diameters of each square. Bisect the semi-diameters and join the points of bisection to form smaller squares. Connect the nearest corners of the smaller squares by two simple curves, concave to each other. Line in the smaller squares, all curved lines and the upper and the lower horizontal lines.

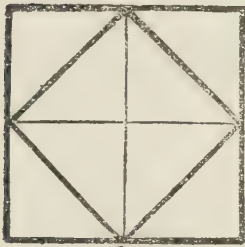
Other figures for descriptive writing and dictation drawing are found in *Compound curves*, *Straight line designs*, *Simple curves* and *Simple curves and straight lines in combination*.

2. Descriptive outlines of designs in Fig. 76.

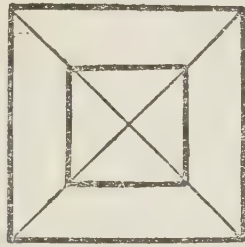
1. Draw a square ; its diagonals and diameters.
2. Draw a square and divide each side into four equal parts. Join the points of division by vertical and horizontal lines to form sixteen smaller squares.
3. Draw a square and its diagonals. Bisect each semi-diagonal. Join the points of bisection to form a smaller square. Line in both squares.
4. Draw a square. Divide it into sixteen smaller squares. Line in the four small corner squares and the inner sides of the other outside squares.
5. Draw a circle. Draw two of its diameters at right angles to each other. Bisect each semi-diameter. Through the points of bisection draw a smaller circle. Line in both circles and those parts of the diameters outside the smaller circle.
6. Draw an equilateral triangle and bisect each side. Join each point of bisection to the angle opposite. From the point where these lines intersect as centre draw a circle touching the sides of the triangle at the points of bisection.
7. Draw a rectangle the longer sides of which are horizontal and four times as long as the shorter sides. Bisect each longer side. Join the points of bisection to form two smaller rectangles. Draw the diagonals of each smaller rectangle. From the points of intersection as centre draw two circles touching the inside of the longer sides. Line in all vertical lines, those parts of the diagonals outside the circles and the upper and lower arcs of the circles.
8. Draw a rectangle, twice as long as it is wide, longer sides horizontal. Draw its diameter, and the diagonals of the smaller squares thus formed. Bisect each semi-diagonal. Join points of bisection to form two smaller squares. Line in the smaller squares and all horizontal lines outside the smaller squares.
9. Draw a rectangle twice as long as it is wide. Divide it into two squares and draw the diagonals of each. Bisect each semi-diagonal. Join the points of bisection to form two smaller squares. Line in the longer sides

of the rectangle, the smaller squares and those parts of the diagonals which are outside of the smaller squares.

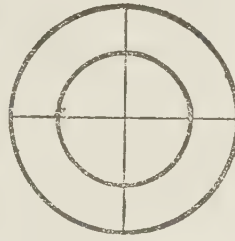
3. Answers.



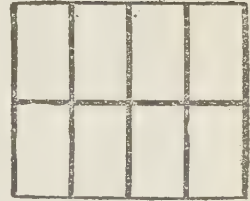
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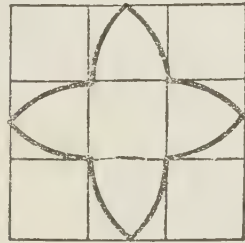
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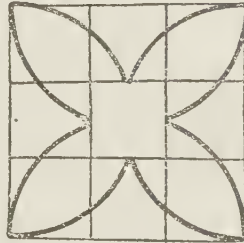
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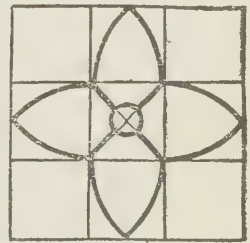
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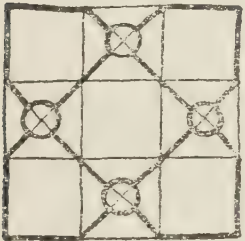
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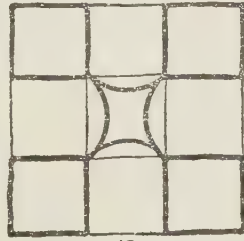
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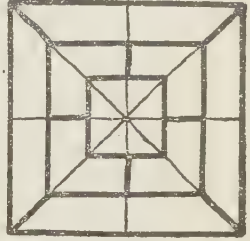
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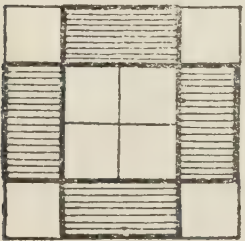
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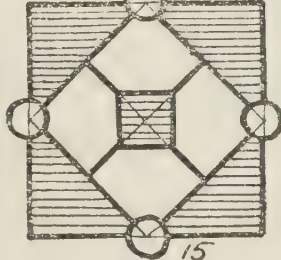
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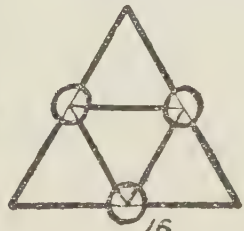
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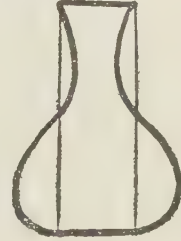
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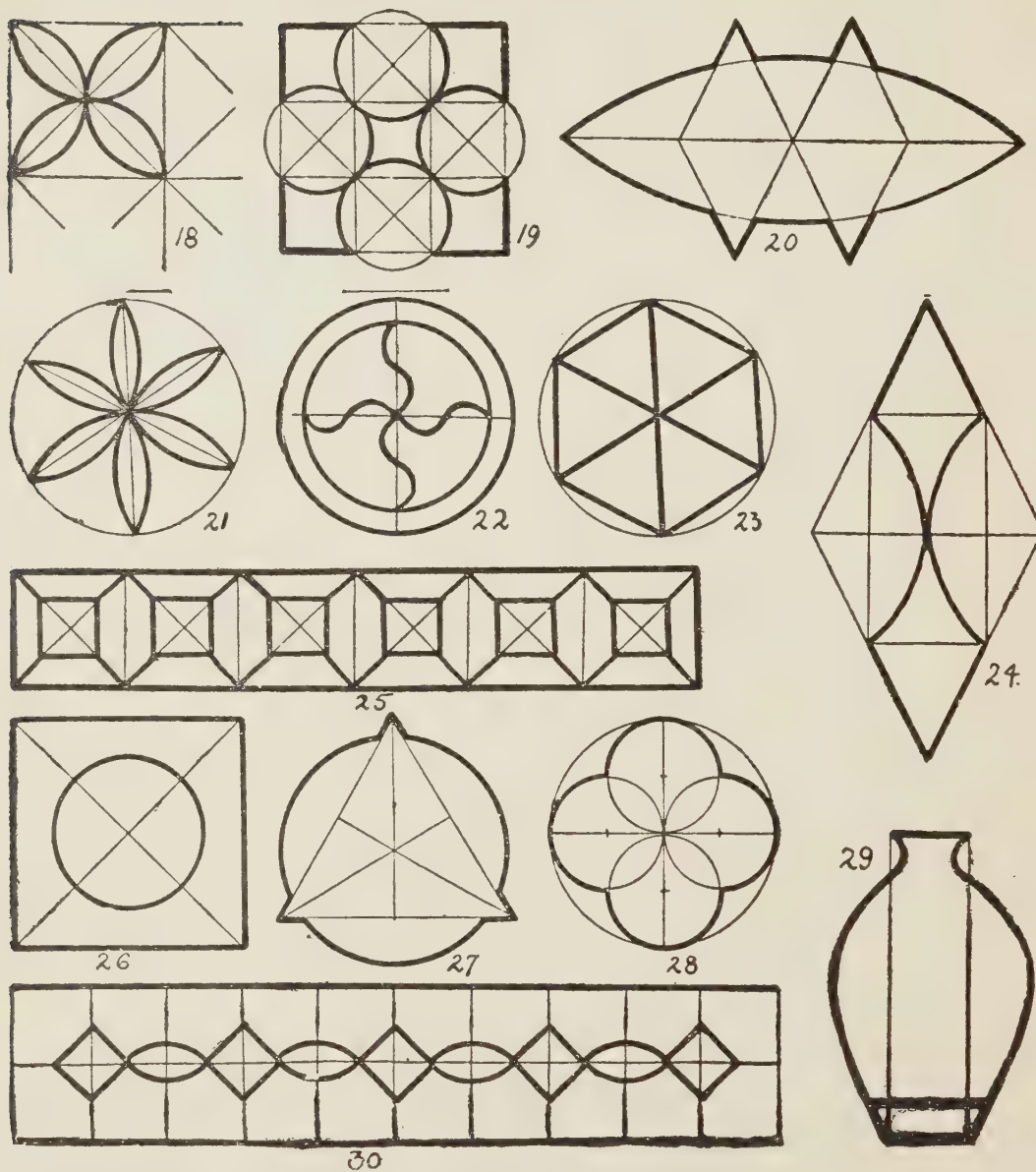
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16



17



NOTE—Figures 25-6-7-8-9 and 30 are of course somewhat reduced in size.

CONSTRUCTIVE DRAWING.

In the construction of buildings and in the manufacture of many articles, workmen are guided by descriptions given them by the architect or designer. These descriptions are made partly in writing and partly in drawing. A drawing will in many respects give a more accurate idea than can possibly be given in a written description. It has, too, the advantage of giving much information in a comparatively small space. These *constructive* or *working* drawings as they are called, are made of the object as it actually is and not as it appears. The written descriptions are called *specifications*.

1. Object.

The making of drawings of this kind, apart from the mental training it affords, will be a means of laying by much information that will be of great practical use in future life.

The impossibility to make drawings the actual size of all objects is quite evident. Some objects are too large, others are too small. The drawing of a building, for example, must necessarily be much smaller than the building itself, while that of the parts of a watch must be much larger. The size of the drawing will matter little so long as it is large enough to be made and read accurately. One thing, however, is very necessary, that is, that the proportions of the drawing correspond accurately with the actual proportions of the object. In order to do this adopt a scale.

2. The Scale.

Draw a line 3 in. long. Divide it into two equal parts. Suppose each of these parts to represent a foot. The whole line will then represent two feet, that is, an object actually 2 ft. long will be drawn exactly the length of this line. Any one knowing this scale may read from the drawing the actual length of the object you intend to represent. If the object is drawn half as long as this line he knows that it is one foot long, and so on.



Fig. 79.

Subdivide each of the parts into twelve equal smaller parts. Each subdivision will represent an inch. An object drawn as long as one large space and four smaller spaces is 1 ft. 4 in. long, etc. This is called a *scale of one-eighth*, because it is one-eighth as long as the distance it represents.

3. Problems.

1. Draw a line 3 in. long. Divide it into equal parts, making a scale of one-quarter.

The scale being one-quarter, the distance to be represented is four times as great as the length of the line, viz., 12 in. Divide the line into twelve equal parts. Each part, which is a quarter of an inch, will represent an inch. A drawing made to this scale is sometimes said to be drawn a quarter of an inch to the inch.

2. Draw a line 3 in. long. Divide it into equal parts, each representing a foot, showing a scale of one-eighth. Use this scale to draw a line representing a wire 16 ft. long.

3. Draw a line 6 in. long and divide it into twelve equal parts. If each part represent a foot, what is the scale?

4. Draw a line six inches long ; divide it into two equal parts. Let each part represent a foot. Use this scale to draw a line to represent three feet.

5. Draw a line three inches long ; construct a scale of one-eighth and use it to draw a line to represent a distance of 2 ft. 6 in. How long is this line?

6. Construct a scale of one-twelfth.

7. Construct a scale of one twenty-fourth, and use it to draw figures representing :

(a) A circle, 6 inches in diameter.

(b) A square, 5 ft. a side.

(c) A rectangle, 4 ft. x 8 ft.

(d) A triangle, the sides of which are 3 ft., 4 ft. and 5 ft.

(e) An equilateral triangle, 7 ft. a side.

8. Construct a scale of one-quarter, and use it to draw :

(a) A square, 4 in. a side.

(b) An oblong, 8 in. x 4 in.

(c) A circle, 1 ft. in diameter.

(d) An isosceles triangle, base 4 in., equal sides 8 in.

(e) A line, 1 ft. 2 in. long.

9. Draw a scale of one foot to the inch. (In this case a line one foot long will represent one inch.) Use it to draw a line to represent one-quarter of an inch. How long is it?

10. Draw a scale of four inches to the inch, and use it to draw :

(a) A circle, one-half inch in diameter.

(b) A square, one-quarter inch a side.

4. The Plan.

NOTE—(') represents feet, (") inches. 2 ft. 6 in. may be written 2'6".

The term *plan* is often used to designate all the drawings made to describe an object. Strictly speaking, it is that drawing which describes that part usually in a horizontal position, such as the top or bottom of a box.

A drawing to describe the side, end, back or front is called an *elevation* and is spoken of as the *end elevation*, *front elevation*, etc.

Suppose the room in which you are to be 20'x30'. The door is 4' wide and in the middle of the end. The teacher's desk 2' by 4', stands on the platform at the farther end of the room. The platform is 5' wide and extends across the room. The desk is in the middle of the platform and 2' from the wall. Draw the plan to a scale of one forty-eighth (one-quarter of an inch to the foot.)

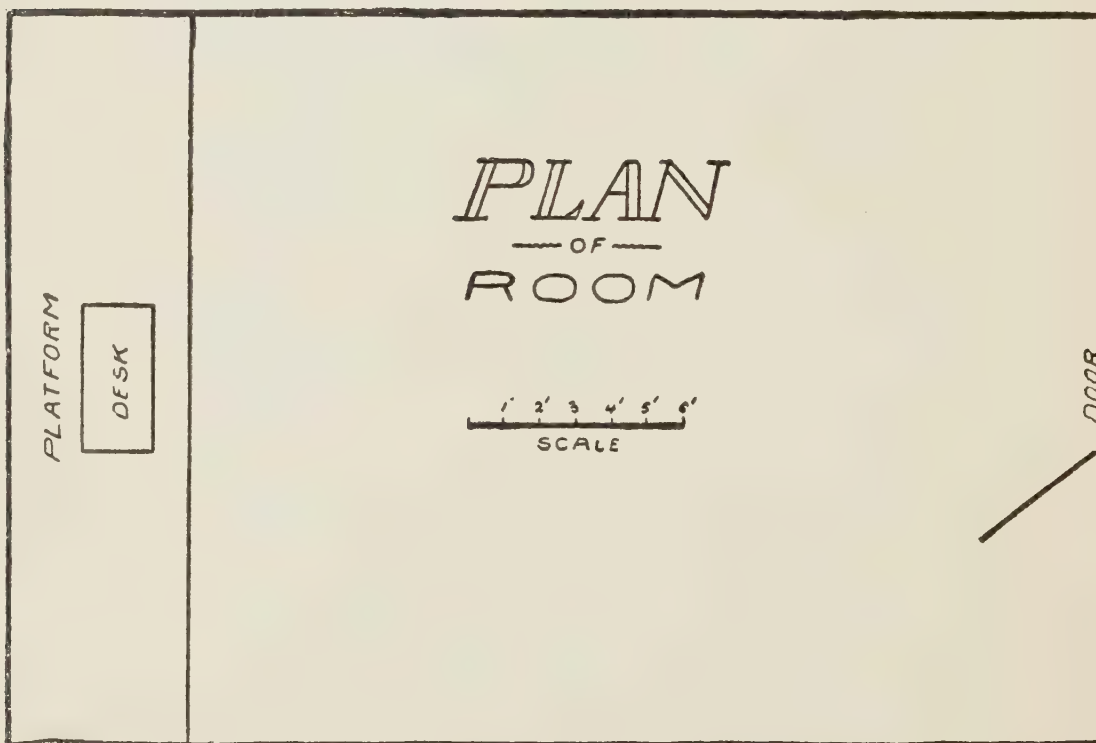


Fig. 80

Fig. 80 shows the plan much reduced in size. The scale which is shown is also reduced proportionately. Use the scale and examine our drawing. Has it been accurately made?

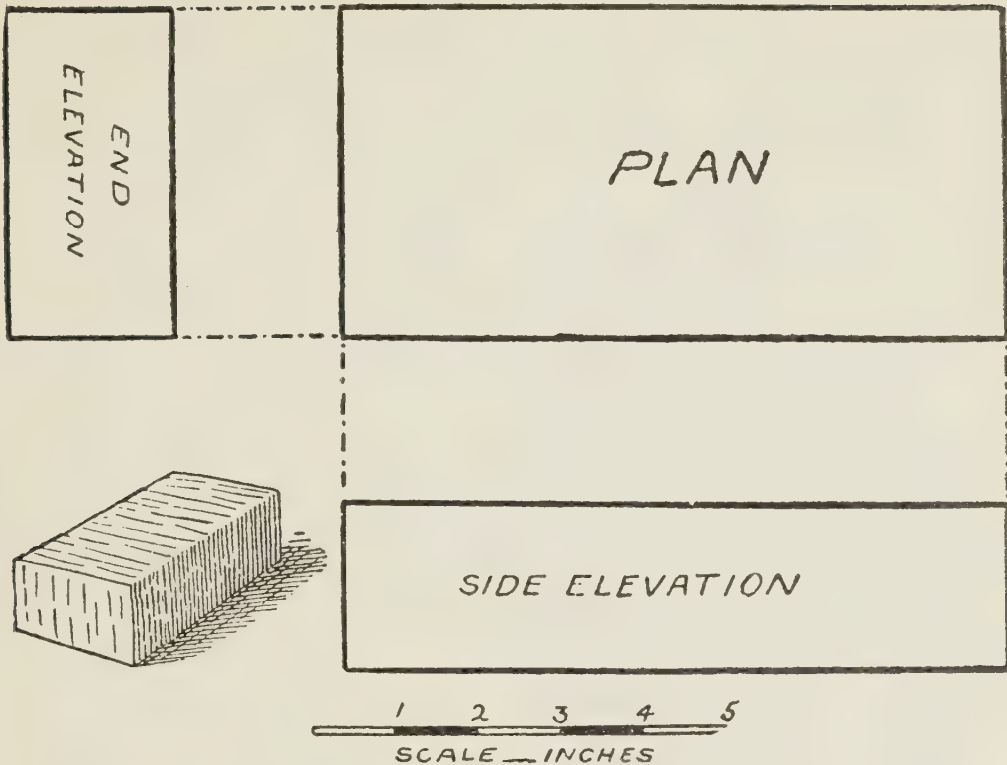


Fig. 81

Fig. 81 shows a *perspective* drawing of a brick, also the *constructive* drawings in proper position to the scale given.

Examine this plan of a box (Fig. 82) according to the scale given.

How long is the box?

How wide?

How high?

In order to further illustrate, two *sections* are given. They are used to show the construction and thickness of material and are usually shaded.

How thick is the material?

5. Problems.

1. Draw a plan of the school-yard to some stated scale.

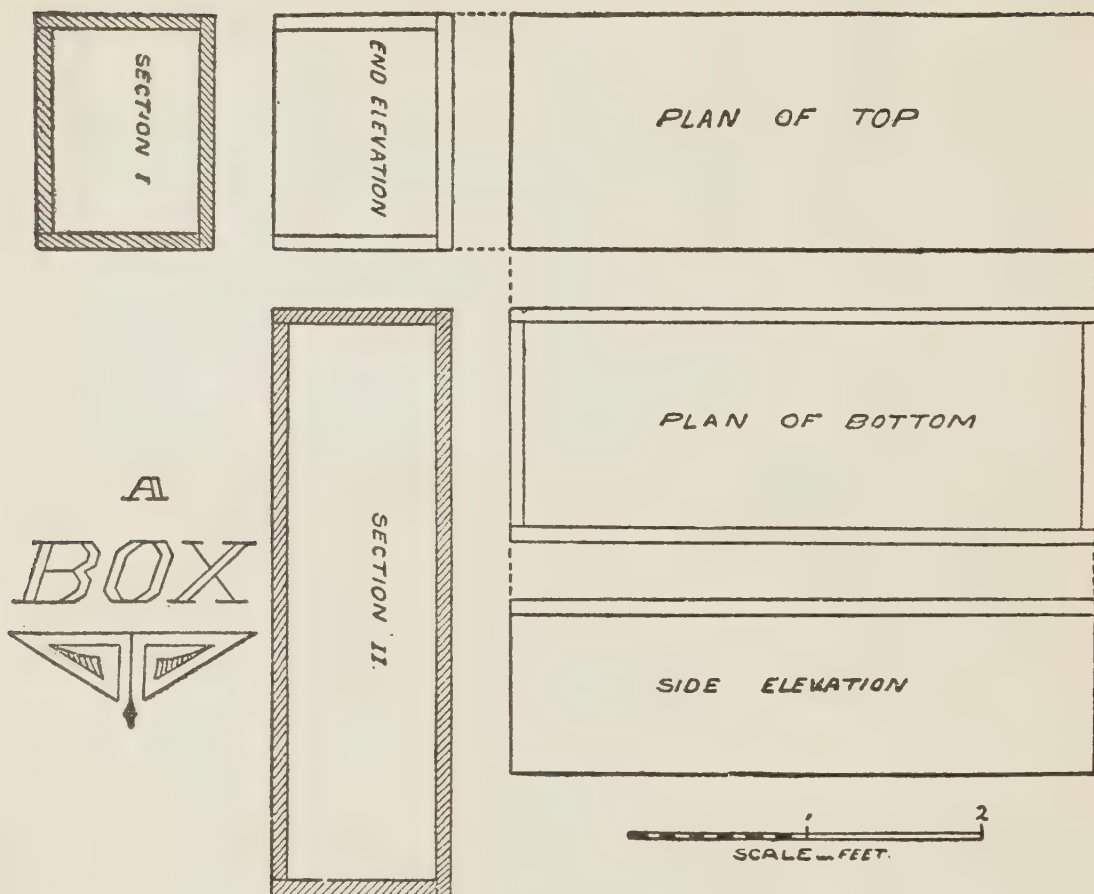


Fig. 82

2. Make constructive drawings of a chalk box.
3. Draw the side and the end elevations of an ordinary kitchen table.
4. Draw the side elevation of a sideboard.
5. Draw the front elevation of the teacher's desk.
6. A tenon 6 in.x3 in. and 6 in. long is cut on the centre of the end of a square stick of timber 1 ft.x1 ft. This fits into a mortise in another beam of the same size and both are held in position by a pin passing through the tenon. Make constructive drawings to a scale of one-twelfth showing fully the method of construction. Show also a perspective view of the joint.

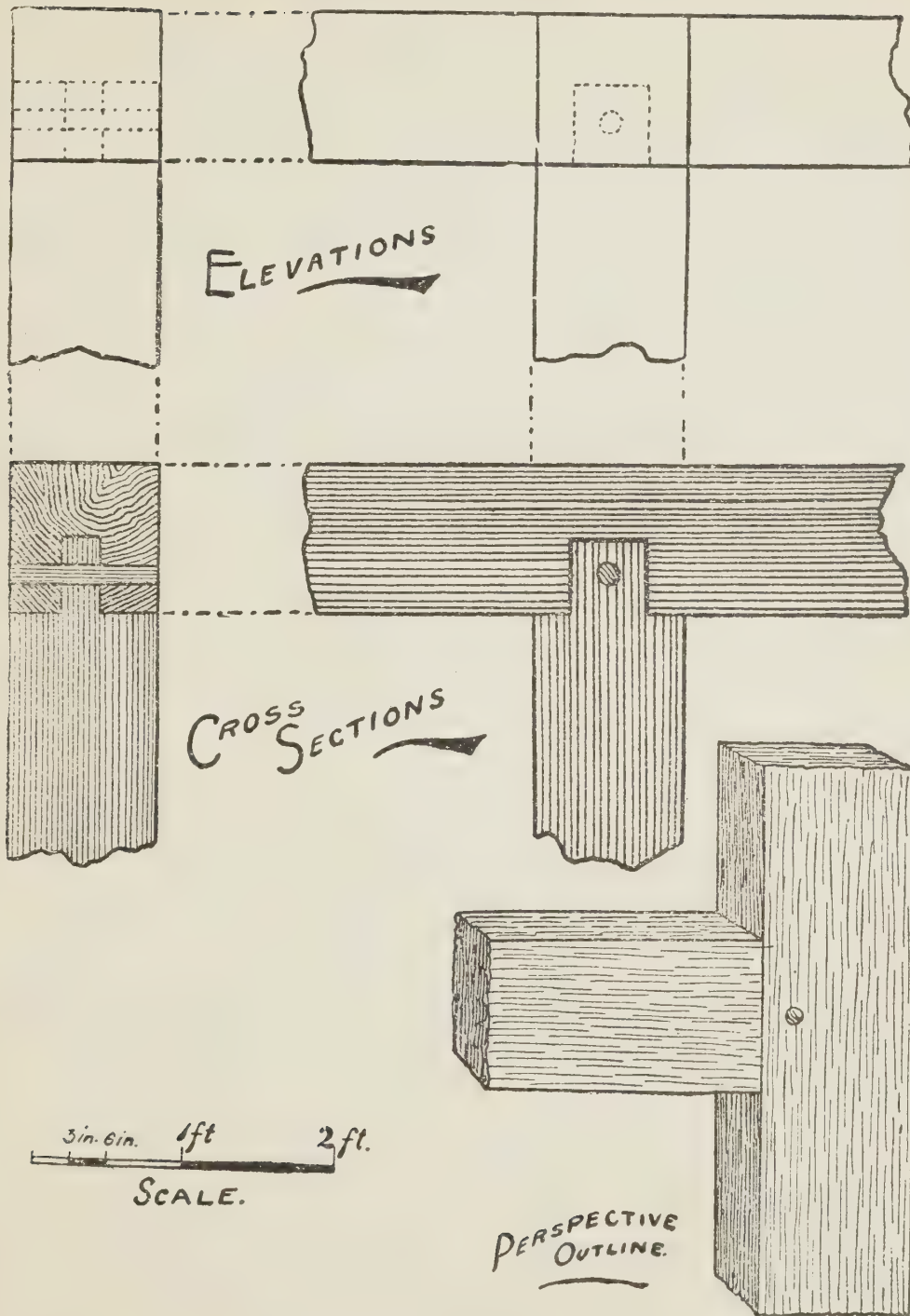


Fig. 83

Our illustration of problem 6 (Fig. 83) is much reduced in size, but since the scale is also reduced you will have no difficulty in reading it.

7. Make constructive drawings of a square mallet having a round handle 18 in. long, face 6 in.x6 in., height of head 12 in., scale one-third.

8. A spool is 12 in. long and 6 in. in diameter at the ends ; length of cylindrical part 6 in. ; diameter of the hole 1 in. ; scale one twenty-fourth. Make the constructive drawings.

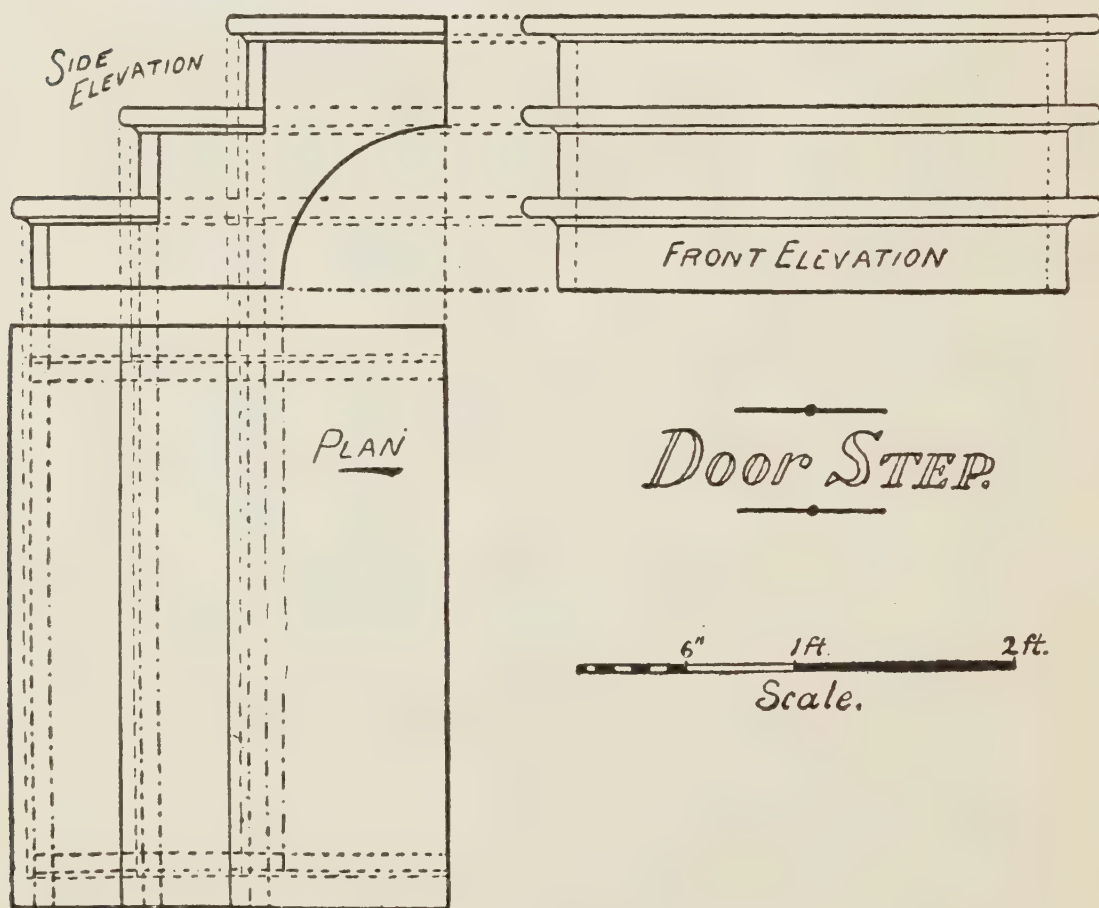


Fig. 84

9. A T-shaped steel bar of a watch is made of material one-sixteenth of an inch square. Total length one-quarter of an inch ; length of arms one-eighth of an inch ; scale 8 in. to the in. Make the drawings.

10. Make constructive drawings of the following, showing fully the method of construction and exact size :

- (a) A ball club.
- (b) An axe.
- (c) A shelf.
- (d) A kitchen table.
- (e) A trunk.

11. Show the method of construction of the corner of a chalk box.

12. Make the plan, front and side elevations of three steps suitable for entrance to a front door.

13. By reference to Fig. 84 which is submitted as an answer to No. 12, write the following in feet and inches :

- (a) Total width.
- (b) Total height.
- (c) Height of each step.
- (d) Thickness of material.
- (e) Width of each step.
- (f) Size of platform at the top.

14. Draw the plan of a baseball ground.

15. Scale $\frac{1}{98}$. Make suitable plans for laying out the ground in front of a house, show paths, flower beds, etc.

16. Make a plan, side and end elevations, and cross sections of a watering trough. Show clearly the construction and scale. Write specifications as to material, painting etc.



Fig. 85

ILLUSTRATION

Art will awaken a sense of pleasure in the beautiful. It will adhere to truth in the idea if not in fact. *Illustration* portrays fact faithfully. Endeavour to combine the two and strength will be gained by putting to practical use the strength already attained.

1. Practical.

The power developed in the study of this subject may be put to practical use at once. The illustration of school work will frequently help to impress facts better than any other method that can be employed.

There are some, it is said, who call up a picture in the mind of everything they intend to do. We all do this to a greater or less degree. The more perfect the mental image the more accurately we can describe in words. Why not make the hand as spontaneously obedient to the mind as the tongue is? We use the tongue to aid us in impressing facts upon the mind, why not the hand?

You read, for example, that, in the War of 1812, the contesting parties were the British and Americans; the American plan was to attack at three different points known as the west, centre and north; that Malden and Detroit are in the west, Lake Champlain and Quebec in the north and Queenston and Niagara in the centre. All this of course may be impressed upon the mind by consulting a map, but it will be much more firmly impressed if, while following the course of the war in the written account, these facts are again reproduced in a picture.

Not only in history is illustrative drawing of practical use, but in almost every other subject on the Public School curriculum, especially geography, literature, physiology and arithmetic.

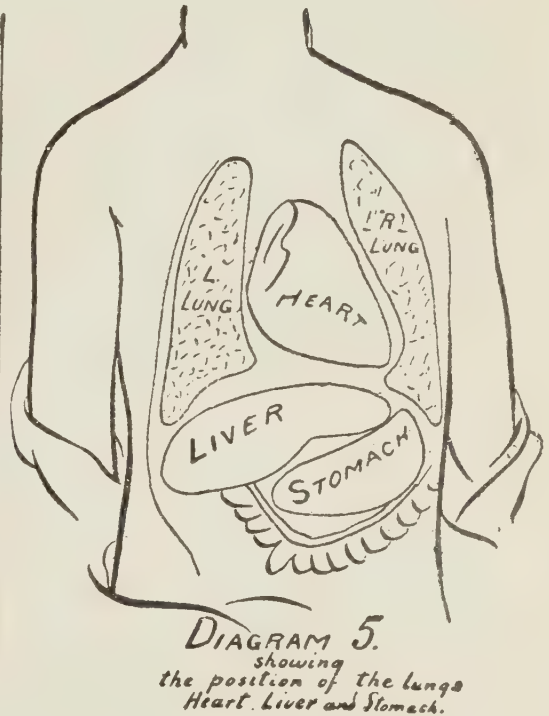
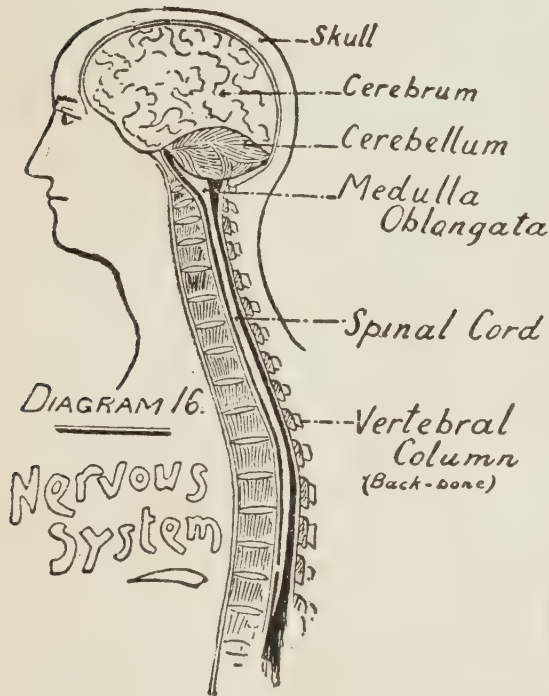


Fig. 86

- Fig. 86 is a tracing from a fourth book pupil's notes on physiology. Fig. 87 is a brief way of stating many geographical facts concerning:
1. Inclination of the earth's axis.
 2. Shape of the earth.
 3. Summer and Winter.
 4. Positions of circles named.
 5. Circle of Illumination.

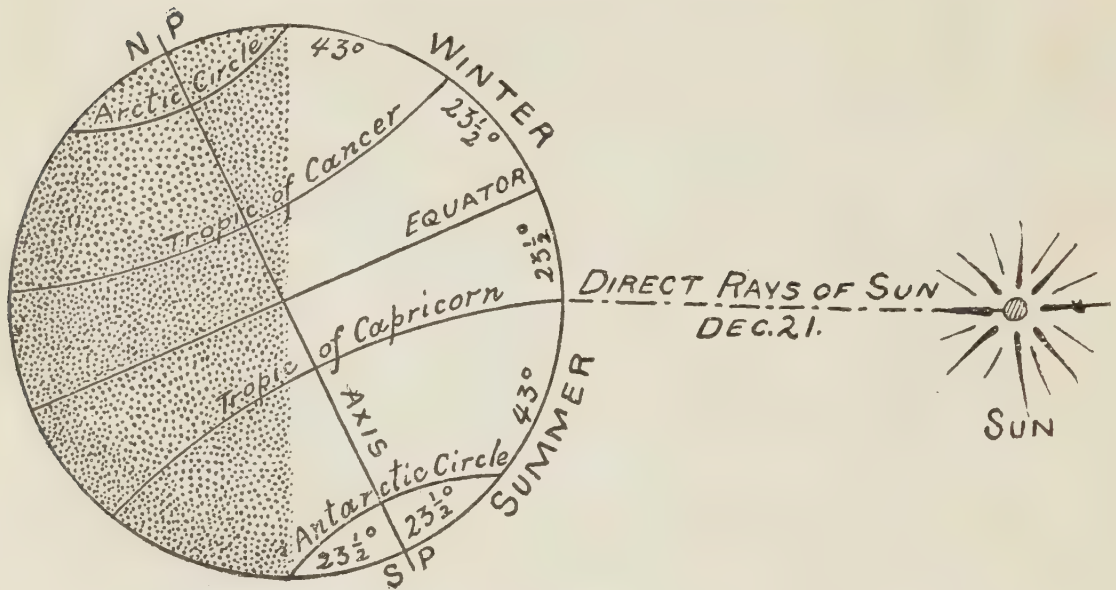


Fig. 87

6. Poles and axis.
7. Summer and winter solstice.
8. Day and night.

On page 94 are three illustrations of that familiar Fourth Reader lesson the Bell of Atri. Do not be discouraged even if first attempts are not what you would like them to be.

2. Lettering.

A little care in the use of letters will give drawings and diagrams a better appearance. Lettering itself is good freehand practice and when mechanically done, develops proper use of the ruler and compass. Apart from this there is a correct form for each letter of every series. This should be noted.

One of the most commonly used styles is the *gothic*. It has the advantage of being plain, easily made and easily read. It is especially adapted to rough illustrative work.

A B C D E F G H I J
 K L M N O P Q R S
 T U V W X Y Z
 a b c d e f g h i j k l m n p o q r s t u v w x y z .

Fig. 88, Gothic

The Gothic is suitable for *To Let*, *Price 25c*, *For Sale*, *Notice*, etc.

It may be variously modified or ornamented to suit the taste of the person using it or the purpose it is intended to serve. It may be high and narrow (*condensed*), short and broad (*extended*), of light, skeleton appearance (*light-faced*), heavy and thick (*bold-faced*), or *shaded*.

A B C D E F G H I J K L M N O P Q R S
 T U V W X Y Z 1 2 3 4 5 6 7 8 9 0

Fig. 89, Gothic Condensed.

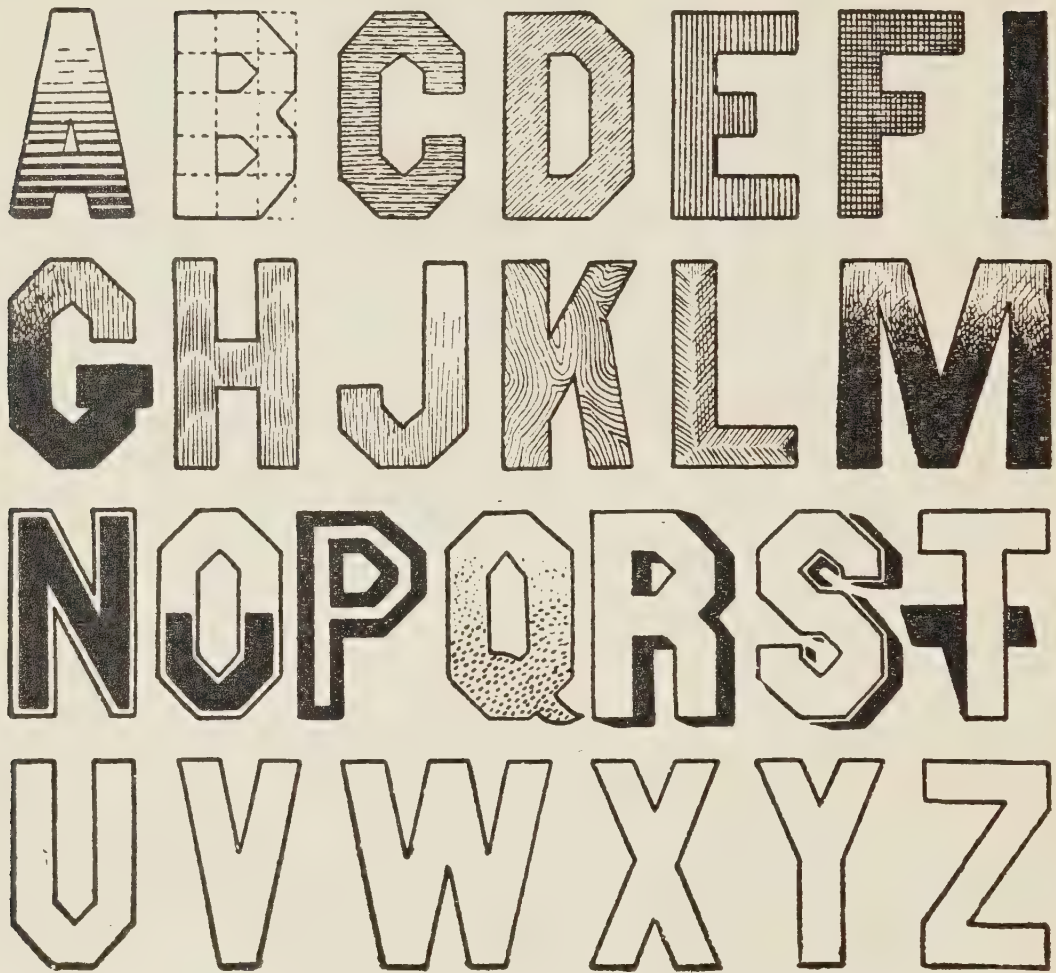


Fig. 90, Gothic Ornamented.

There are two common mistakes made in lettering. The first is a failure to discriminate between, as printers say, the *Cap* and *Lower Case* letters, that is, capitals and small letters.

To one who understands the difference, a card lettered as in fig. 91 appears quite ridiculous.

The second mistake is a failure to keep the slant of all letters of the

same series the same. No matter how well each letter is made, if the slant varies the general appearance is bad.

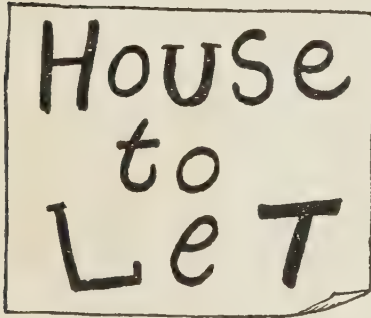


Fig. 91

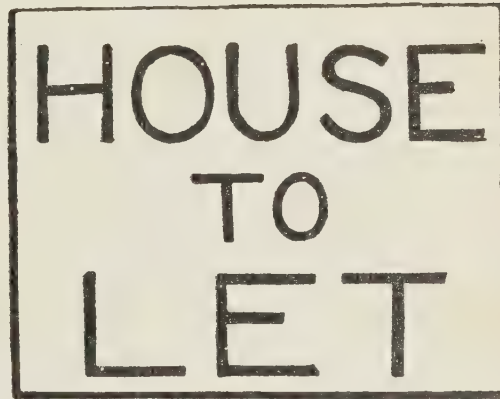


Fig. 92

Compare fig. 92 with fig 91.

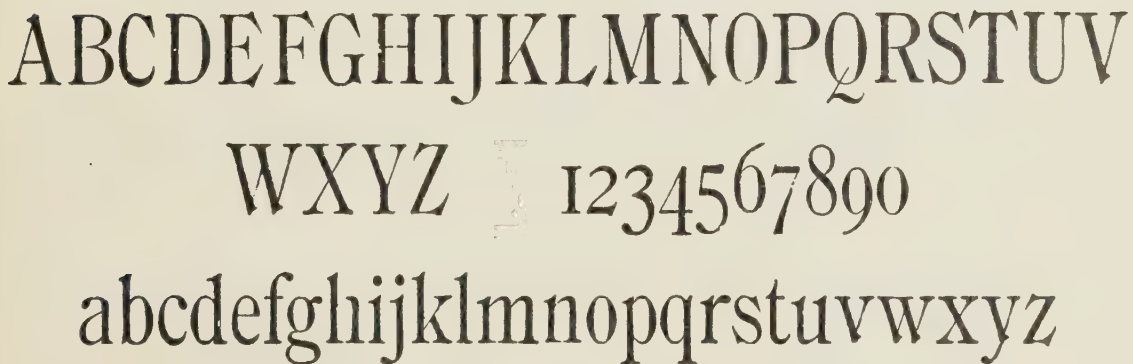


Fig. 93, Roman

Roman and *Italic* are the styles used in printed books. The making of this letter is good practice but it is not simple enough in construction to be of very great convenience in ordinary illustrative work.

A B C D E F G H I J K L M N O P Q R S T U V

W X Y Z 1 2 3 4 5 6 7 8 9 0

a b c d e f g h i j k l m n o p q r s t u v w x y z

Fig. 94, Italic

A B C D E F G H I J K

L M N O P Q R S T U V

W X Y Z

a b c d e f g h i j k l m n o p q r s

t u v w x y z

. , : ; ' ? ! " "

1 2 3 4 5 6 7 8 9 0

Fig. 95, Script

Script is a very common style and particularly suitable for pen work. It is quite appropriate for addresses, invitations, etc. There are very many designs.

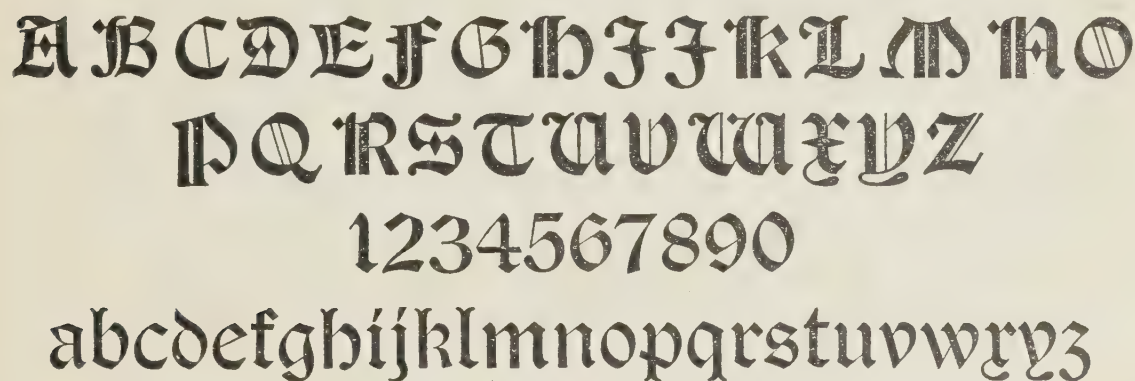


Fig. 96, Old English

Old English is extensively used in engrossed addresses, certificates, etc.

The following *Pencraft* alphabet is also suitable for pen work.

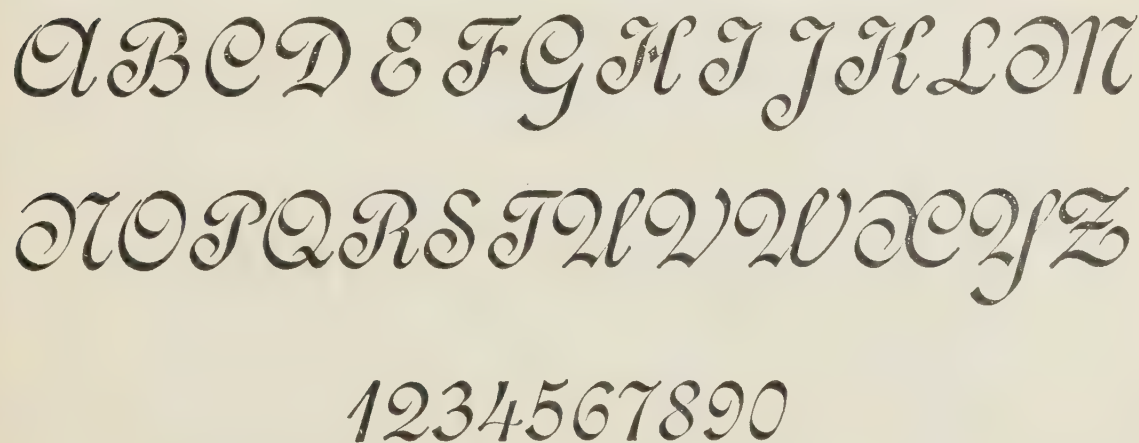


Fig. 97, Pencraft

The De Vinne alphabet is an artistic and easily-read style.

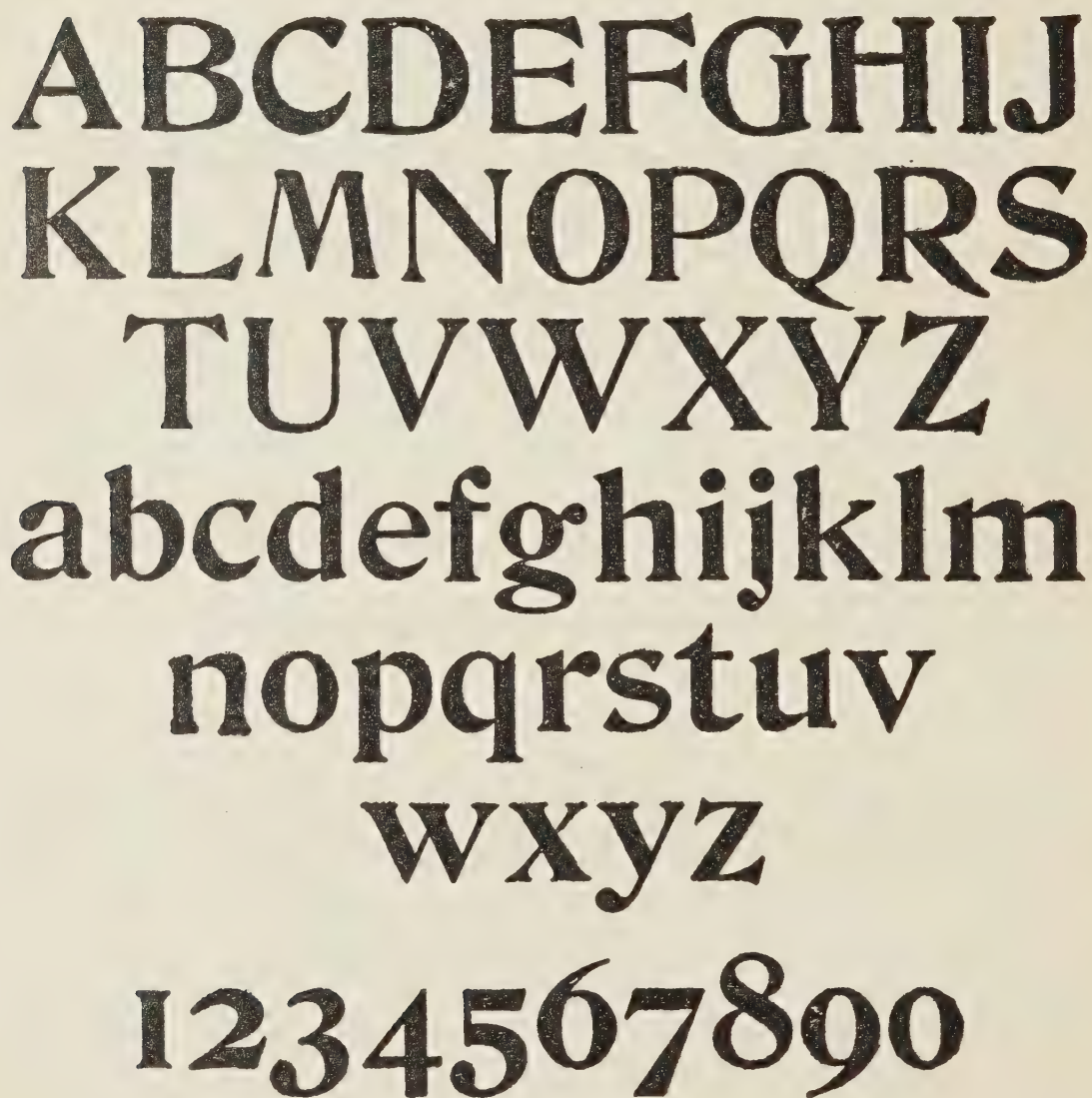


Fig. 98, De Vinne

For the purpose of drawing attention to the peculiar formation of similar letters we submit an alphabet of the *Antique*. In this alphabet com-

pare carefully b and d, b and q, d and p, p and q, n and u. Notice, too, that all capitals are of the same height and all lower parts of the small letters are of the same height.

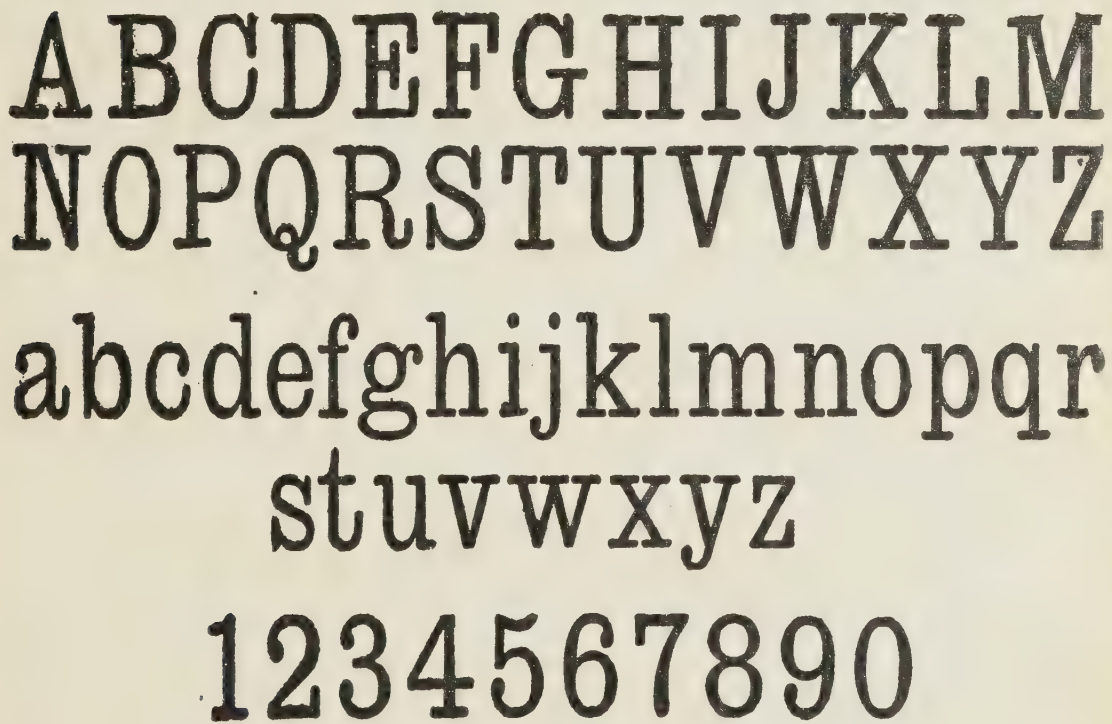


Fig. 99, Antique

An excellent exercise is to choose some style of letter and print neatly a few lines of some favorite poem.

The style of letter used in "Youth and Age," may be termed an *Art Gothic* and is quite suitable for the work suggested.

In addition to the styles already given fig. 100 and 101 are added for practice.

Youth and Age.

Impatient of his childhood,
 "Ah me!" exclaims young Arthur;
 Whilst roving in the wild wood,
 "I wish I were my father!"

Meanwhile to see his Arthur
 So skip, and play and run,
 "Ah me!" exclaims the father,
 "I wish I were my son!"
 — Hood.

A B C D E F G H I J K L M N O P Q
 R S T U V W X Y Z

a b c d e f g h i j k l m n o p q r s t u v w x y z

. , : ; ' ? ! =

1 2 3 4 5 6 7 8 9 0

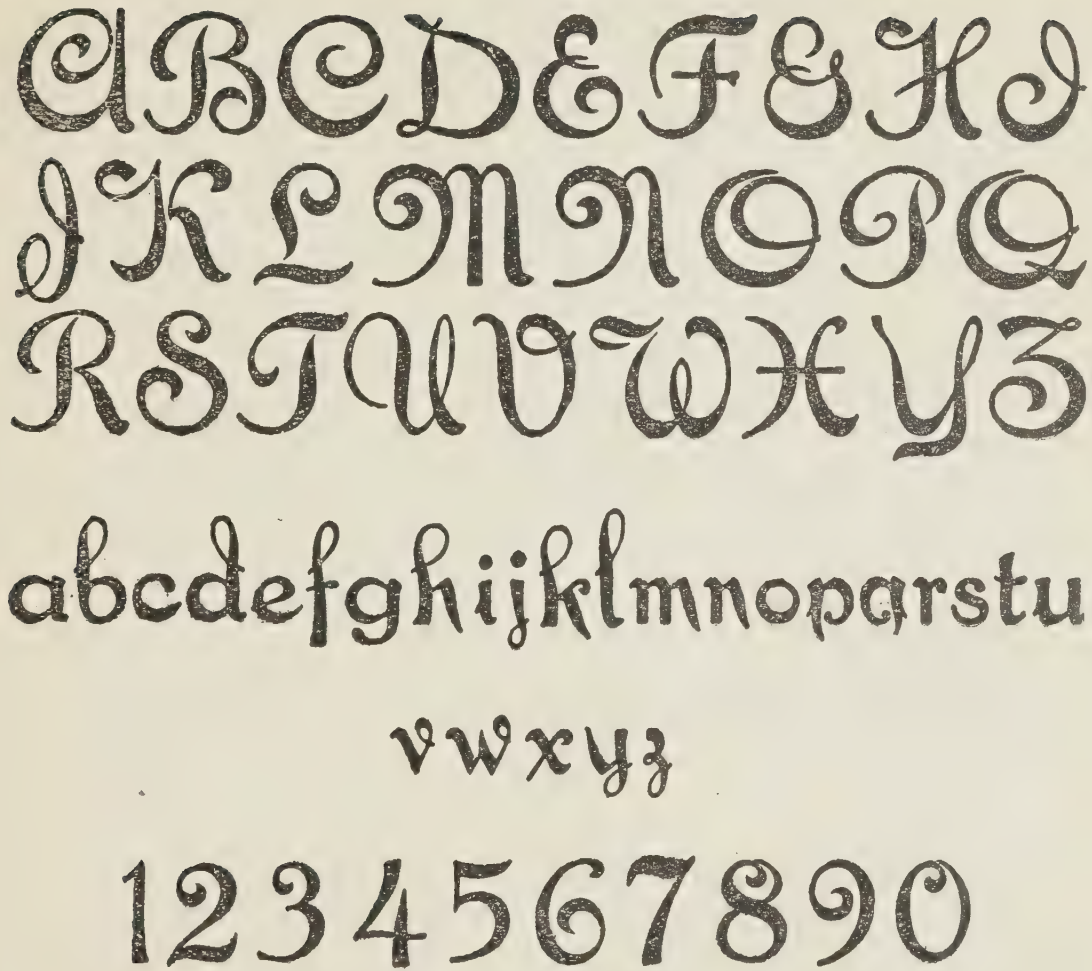


Fig. 101.

3. Picture Stories.

The illustration of a story—telling the story by pictures—is very difficult work to do well. All drawing should be suggestive. If it tells nothing it is not interesting, only in so far as it affords a method of practice or displays the dexterity of the person executing it. Many artists draw beautifully yet never become famous, while others, by a few strokes of the pen, leap into prominence at once. Why? Simply because they are able

to suggest much and do it in an interesting manner. Drawing then, at least in this department, should first tell something, and secondly, tell it in as pleasing a manner as possible, or in such a manner as the circumstances demand.

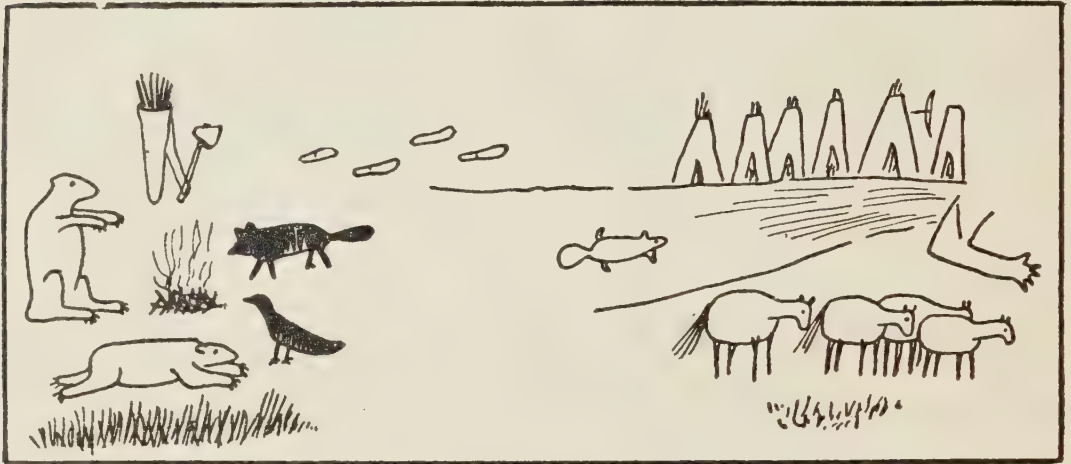


Fig. 102

We submit for example a picture, copied from some old Indian manuscript, supposed to say : The Chiefs, Black Wolf, Raven, Fast Bear and Sitting Bear hold a war council round the fire where grass was high. They dig up the hatchet, have plenty of arrows and start on foot to a Cheyenne (cut-arm is the Cheyenne sign) village on Beaver Creek, where they expect to have a fight and stampede a herd of fat ponies.

This of course may not be regarded as displaying great artistic ability. True, some one else may have been able to do it much better. Its primary object, however, was to tell the story and we suppose it did.

We shall be able to present but very few illustrated stories—only enough to throw out a few suggestions along this line. The following are from work done in the primary grades.

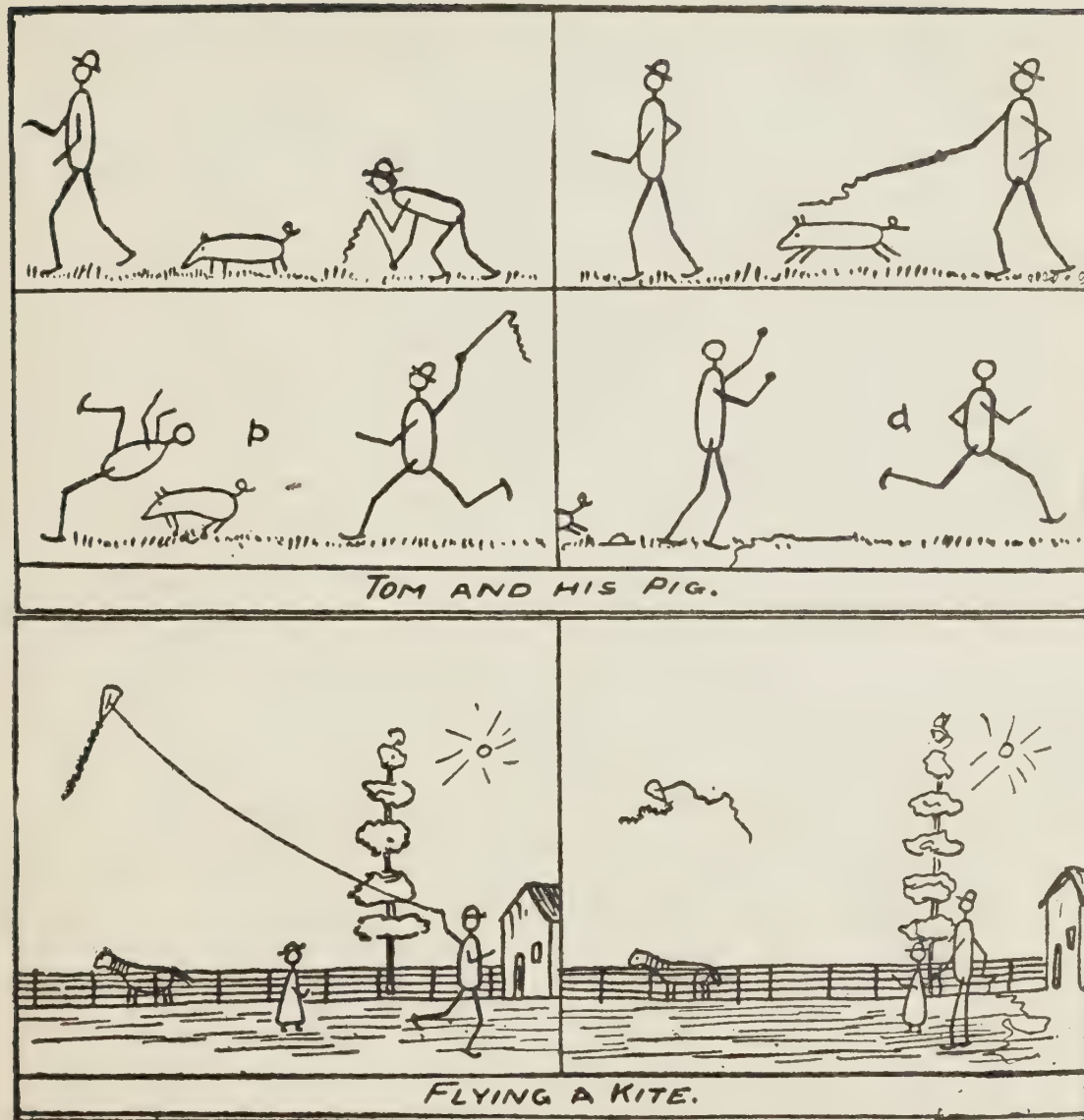


Fig. 103

Do not be discouraged if you are unable to make pictures worthy of competition with those of others who have had much greater experience. They, too, passed through the primary stage and probably did work then that

could not creditably compare with yours. Be content with doing each time your very best. These little fellows in the pictures may not be much like real men. It may be too that our little artists were influenced by the drawings of some one else. We shall not discuss this point, but be content with saying that they are simple stories, told in a simple child-like manner.

Illustrate the following stories :

1. A dog and a cat were firm friends. They ate out of the same dish and slept on the same mat.

2. John and Mary, a little brother and his sister, started out to school together one fine morning in May. They had to cross a long bridge. Just after crossing the bridge they saw a large dog coming to meet them. They were very much afraid but ran quickly and were soon safe in the school-house.

3. Tommy had a beautiful pony. On Saturday he rode him to the fields to pasture. One day the pony became frightened at a large hog that ran from under a tree on the side of the road. Tommy did his best to hold on, but the pony jumped to one side, threw him off and ran away. Tommy was not hurt much but felt very sorry because he had to walk home.

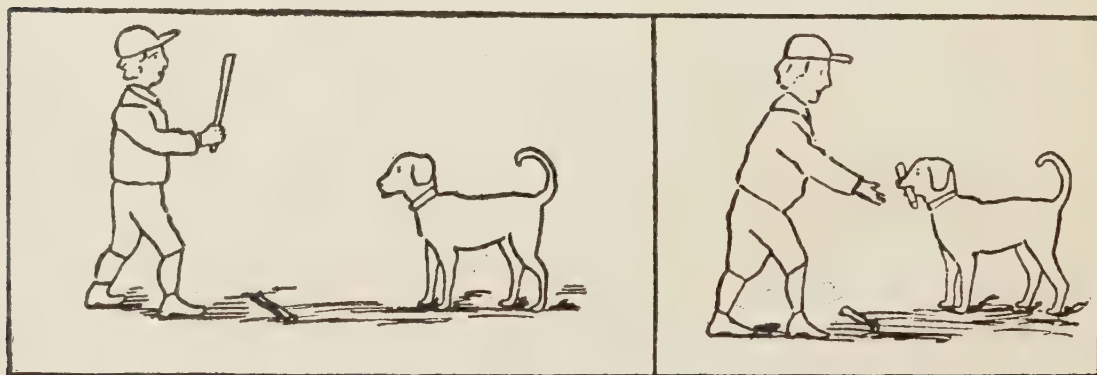


Fig. 104

With practice comes development in the power to see, as well as a growing ability to suggest more of what is seen. The characters soon

partake more of the nature of the original. The stories too will contain more of literary merit. Plenty of material is found in the reading books. It is good practice to write these lessons neatly and fill in suitable illustrations as you proceed.



Fig. 105

Much practice will result in quite presentable pictures. These ought to be carefully preserved if for no other purpose than the pleasure they will afford in looking over at some future time.

It is not always necessary that a number of illustrations should be made to tell a story. One picture well made and carefully composed will often tell all that is required. Remember that progress will depend largely, not upon the amount but upon the quality of work done.



Fig. 106

Fig. 106 and 107 are given merely for the purpose of showing what may be done and not to furnish copy.



Fig. 107

Compositions may be illustrated. If time will not allow this to be done fully, a suitable initial, such as is shown in Fig. 108, will amply compensate for the time spent in drawing it.



Fig. 108

215 108

A Riggys Joke.

A long time ago a little black puggy was eating grass in the fields. Just as he



poked his nose over the crest of a knoll he saw two little white pigs sitting on a bench. They were talking and did not see him.

A very nice chance, thought he, to play a joke.

He then walked up very, very quietly behind them and tied their tails together. He ran home to the sty as fast as he could.



Poor little piggies! You should have heard them squeal.



They were soon free and ran to the sty as they were much afraid of what took place.



PART III.

OBJECT DRAWING

Object Drawing is the representation of an object on a flat surface as it appears when viewed from a certain point. This point is the eye of the spectator, it includes *Model* and *Memory Drawing*.

There is, in fact, but little difference between them. If the sense-impression gained by viewing an object is retained to be of use in re-presenting it on a flat surface, when that object is not in view, such representation is termed *Memory Drawing*. On the other hand, if the re-presenting is done while the object is still in view, the sense-impression is carried but a short time, and the term applied is *Model Drawing*. In reality the only difference is in the time intervening between the receiving of the sense-impression and the expression of it.

In many respects, *Memory Drawing* is the more fascinating, simply because the variety of objects, their positions and conditions are unlimited. Not only is this true, but landscape, animals, birds, flowers, etc., are constantly changing, thus presenting something always new and which will always arouse human interest.

Drawing from the flat or copying drawings will give instruction in the methods of others, and help to gain facility in the use of the medium. It may be termed the primary stage. *Model Drawing* seeks to develop the observation of the object itself. It may be termed the intermediate stage. *Memory Drawing* calls for the clearest perception of form and most accurate method of expression. It is the highest stage.

1. The Drawing Book.

We strongly recommend using a drawing book. It should be well bound and made of good material, such as we have mentioned in *Materials and Their Uses*. This book of all others should be a model of neatness.

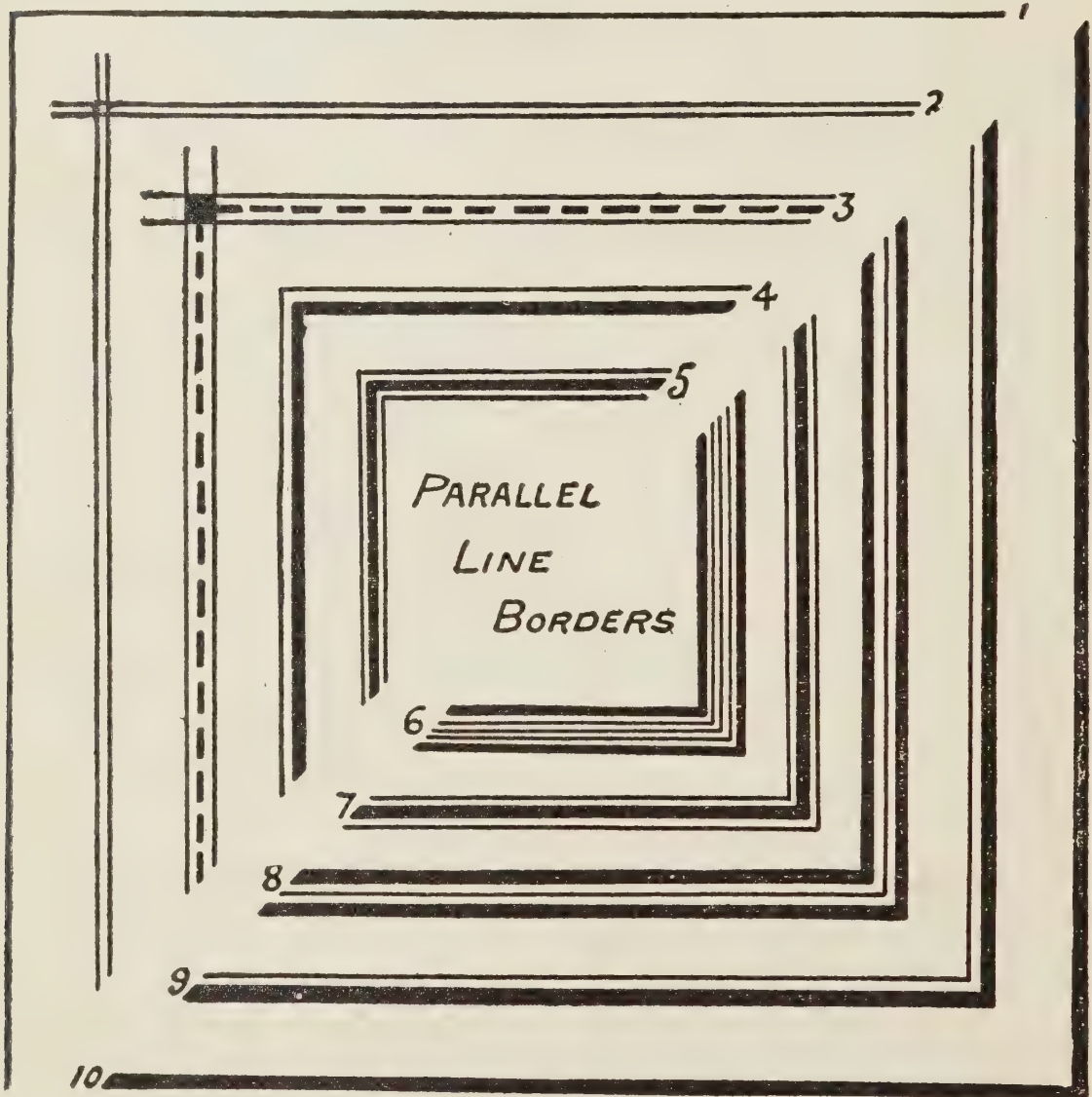


Fig. 109

1. Do your best every time.
2. Use only the best material. It will pay.
3. Never roll or fold your drawing book.
4. If pencil is used, insert tissue paper leaves to keep the drawings from becoming blurred.
5. Avoid frequent rubbing, as it tends to give a dauby, dirty appearance.
6. Avoid a heavy sketch, as it spoils a clear cut appearance.
7. If pen is used, on no account should the rubber be used until all pen work is finished and well dried. The rubber spoils the surface of even the best paper and causes the ink to blot.
8. A plain rectangle or border of straight lines drawn round each figure will add to its appearance. A few straight line borders are shown in fig. 109.

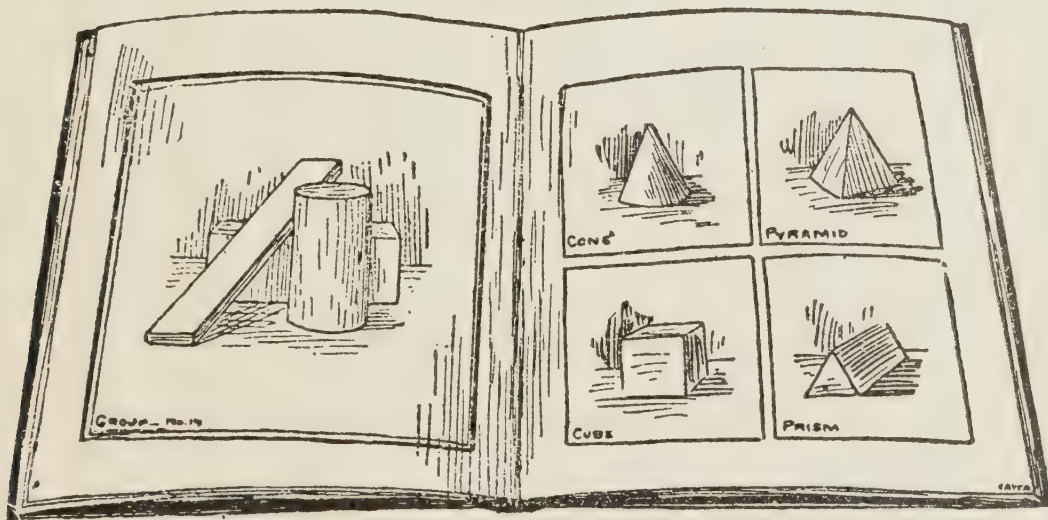


Fig. 110

9. If the leaves are small, place but one picture on each page ; not more than four. Strive, by an artistic and symmetrical arrangement, not only to make each drawing, but the whole page, look well.

10. If drawing sheets are used, they should be carefully preserved and afterwards sewed together. Leave a margin of two inches on the left for this purpose.

2. Outlines.

Outline Drawing is representing by a continuous line or lines the limits of an object. An outline drawing of the first tablet for example is made by drawing four straight lines to define its exact boundaries. These lines must be of equal length and the angles at the corners must be right angles to suggest its equal sides and square corners. There is no other simple way of suggesting objects except by shading. The outline is easier to make and the natural one to begin with.

Hamerton says: "The mental processes by which man has gradually become able to draw, in our modern sense of the word, may be followed as the development of a chicken in the egg, by examining specimens in the various stages of formation. The first idea of drawing is always *delineation*, the marking out of the subject by lines, the notion of drawing without lines being of later development. The historical development of drawing may always be seen in the practice of children when left to draw for their amusement. They begin, as the human race began, with *firm outlines* representing men and animals usually in profile."

The outline should be a line of even thickness and clearly cut so that the space enclosed by it should represent the form of the object you desire to suggest.

To make outlines proceed as follows :

1. Observe clearly the general outline of the object.
2. Examine the form, relative size and position of the parts of this general outline.
3. "Block in " roughly the space to be occupied by the drawing or sketch the type form that will be used as a basis upon which to construct the outline.
4. Commencing with the parts proceed to build up the outline by

placing them together, keeping constantly in view the general outline, and observing at each step the form, size and relative position of each part.

5. Arrange the detail.
6. Strengthen the outline.
7. Erase construction lines and other unnecessary markings.

The outline should be *sketched very lightly at first with a hard pencil*. If you are not satisfied with any part of the sketch *do not use the rubber*, but correct the direction of the lines at once without rubbing. The rubber must be used only to clean up the drawing and erase construction lines after the outline has been perfectly defined.

Some successful teachers of drawing advocate what is sometimes termed *Mass Drawing*. Even in this method a distinct definition of the boundaries of the object must be kept in the mind, so that really the only difference between *Mass Drawing* and *Outline* is that in the first the outline is kept in the mind, while in the latter it is represented by lines. Outline as before stated is, we believe, the natural method to begin with.

3. Models—Sticks and Tablets.

A line represents either *edges*—the meeting places of surfaces—or defines *boundary*.



Fig. 111

In addition to the objects immediately at hand procure :

1. A number of straight sticks of different lengths and of dark color. Ordinary matches will do if nothing better can be had.

2. The following tablets which may be cut from an ordinary piece of cardboard : The square, rectangle, right angle triangle, equilateral triangle, isosceles triangle, circle, semi-circle, ellipse and oval.

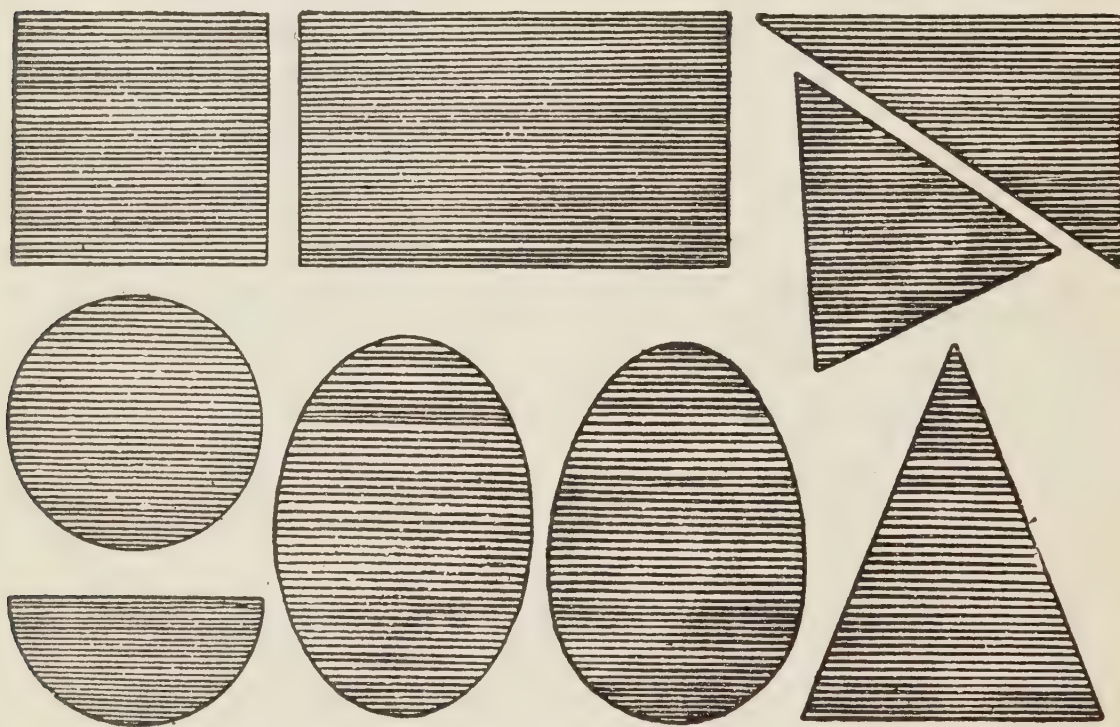


Fig. 112

Sticks.

Such objects as houses, fences, etc., cannot be brought to the school-room or study. Representations of them may be made with the sticks. In fact, these toy houses, fences, etc., will serve the purpose very well at this stage of the work.

Suppose the first model to be a house. Lay a long stick for the foundation ; two more for the walls ; another long one for the ceiling ; two

of medium length for the roof. Much shorter ones will do nicely for a door and a window. Here it is.



Fig. 113

Before attempting to draw, examine the model very carefully. The height is a little greater than the width. The roof projects slightly over each of the sides. It consists of two parts. The lower part is a rectangle, the upper part a square. The door is rectangular and a little longer than the window. The foundation is horizontal, the sides vertical and the roof oblique.

Sketch a horizontal line to represent the foundation. Compare the width of the foundation with the length of the side. The side is slightly longer. Sketch the sides, first indicating by points the position of the upper and lower ends of the lines that will represent them. Compare the length of the ceiling with the foundation. Sketch the ceiling.

What is the relative position of the highest point? It is directly above the centre of the ceiling. Compare the height of the triangular part with the height of the rectangle. It is about one-half. Indicate the highest point. Sketch the roof.

This outline sketch should be made very light and now compared carefully with the model. If no corrections are necessary proceed to fill in the detail—the door and the window.

Compare the width of the door with the width of the house, the height with the height of the rectangle; the distance between the door and each wall with the total width, etc.

In the first practice of Model Drawing, too much attention should not be given to proportion. Strive to obtain correctness of form. Avoid the too common practice of drawing a line at random and changing the direction if it is not correct. To aid in this respect, indicate the ends of the line by dots, after which it may be drawn practically correct, both in proportionate length and direction.

Sketch the door ; the window in the same manner. Compare the whole sketch again with the model. Make any necessary corrections without the use of the rubber.

Line in.

Erase any lines not required.

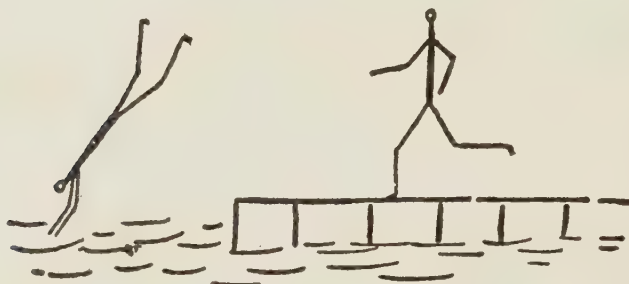


Fig. 114

Construct other models and draw in a similar manner. In fig. 115 are a few outlines for the purpose of comparison.



Fig. 115

Tablets.

Draw the square, rectangle and triangle in the same manner as the house, giving attention, first, to the general form, and second, to proportion.

An envelope, a sign, a sheet of paper, a slate, and many other objects are similar in form to the square or rectangle. Use as many of these as can

be had for models. Draw others from memory and compare the drawing with the original.

There are three methods of drawing the circle. First: Sketch two or even three diameters, intersecting at the centre. Draw the circumference touching the ends of the diameters. Second: Make a dot to represent the



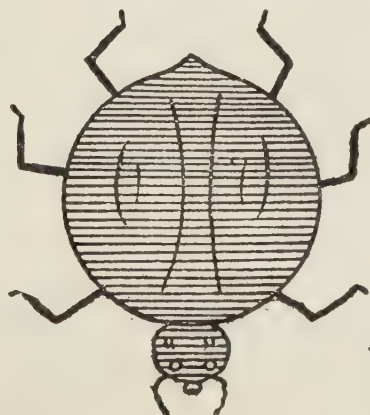
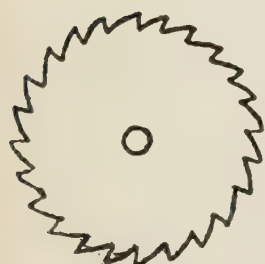
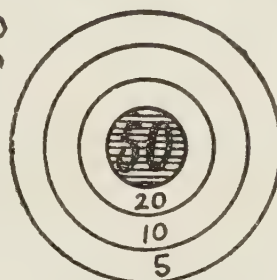
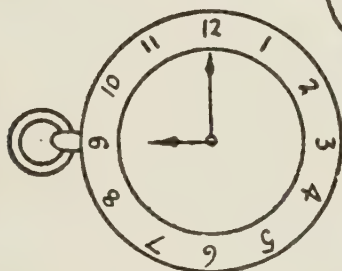
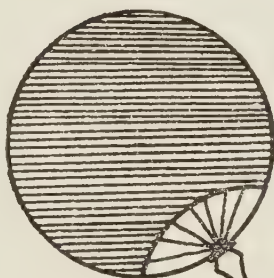
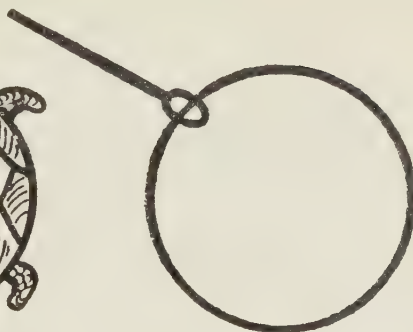
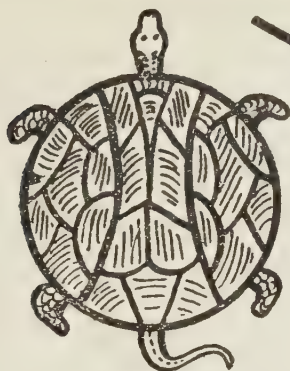
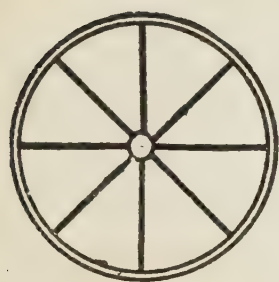
Fig. 116

centre. Draw the circumference. As you do so endeavor to keep the pencil point always the same distance from the centre. Third: Draw the circumference freehand without any aid but the eye. This is the best method. See *Practice in Freehand Drawing*.



Fig. 117

Such objects as a button, a fan, a coin, resemble the circular tablet in form. The outlines of such objects are based on the circle.



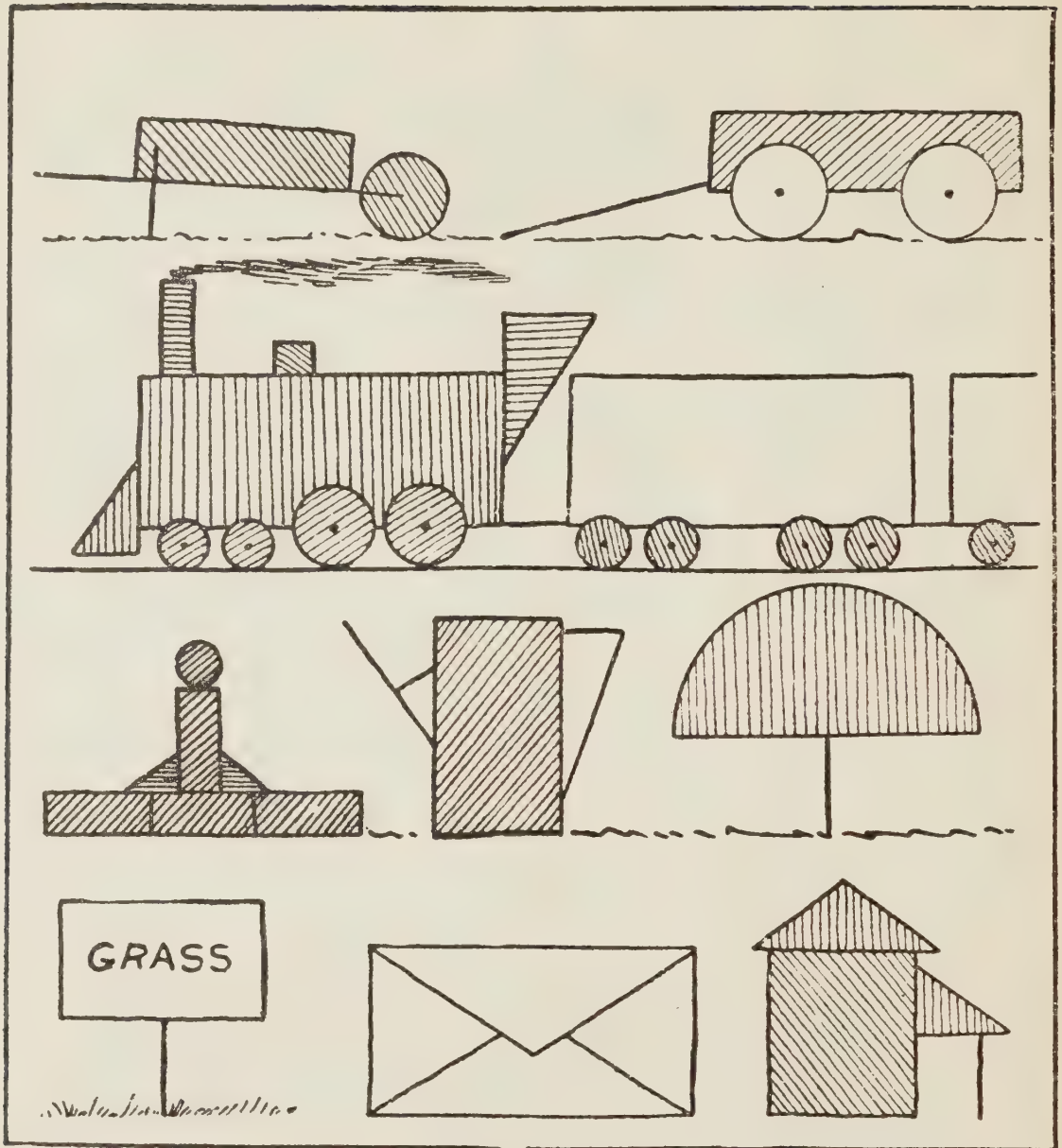


Fig. 119

Draw the ellipse and oval in the same manner as the circle.

Fig. 119 gives suggestions for models constructed by using sticks and tablets in combination. Build others and draw their outlines.

4. Making Models.

It is impracticable at present in most public schools to make models of clay. A very good set, comprising the type forms, may be purchased at almost any stationer's. If, however, these are not to be had, a very servicable set may be made by following the instructions here given. The best material is a white, stiff paper. Manilla is better than cardboard.

The Cube.

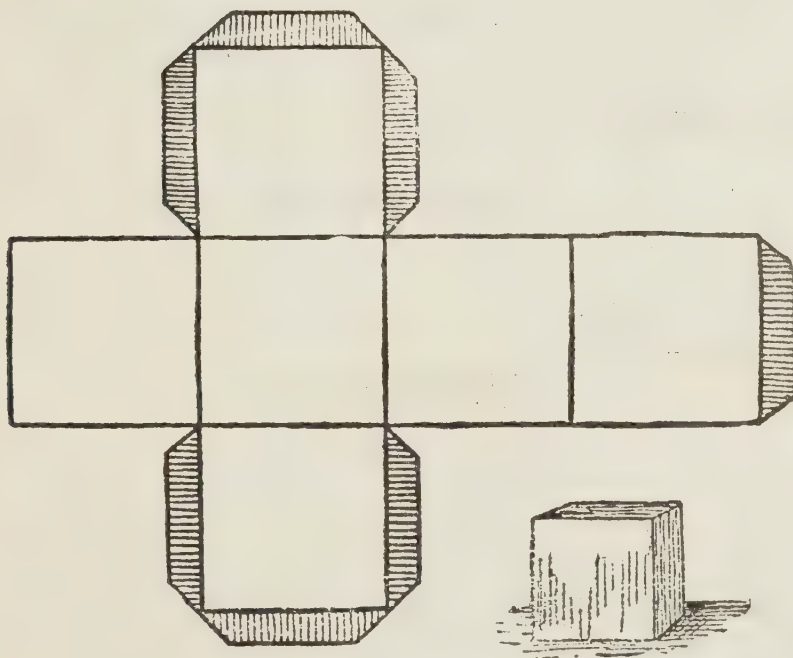


Fig. 120

Lay out the plan as shown in fig. 120. Cut neatly round the outside and fold at the lines. Stick the shaded flaps with mucilage. The six equal squares correspond to the six faces of the cube, and may be made any size desired.

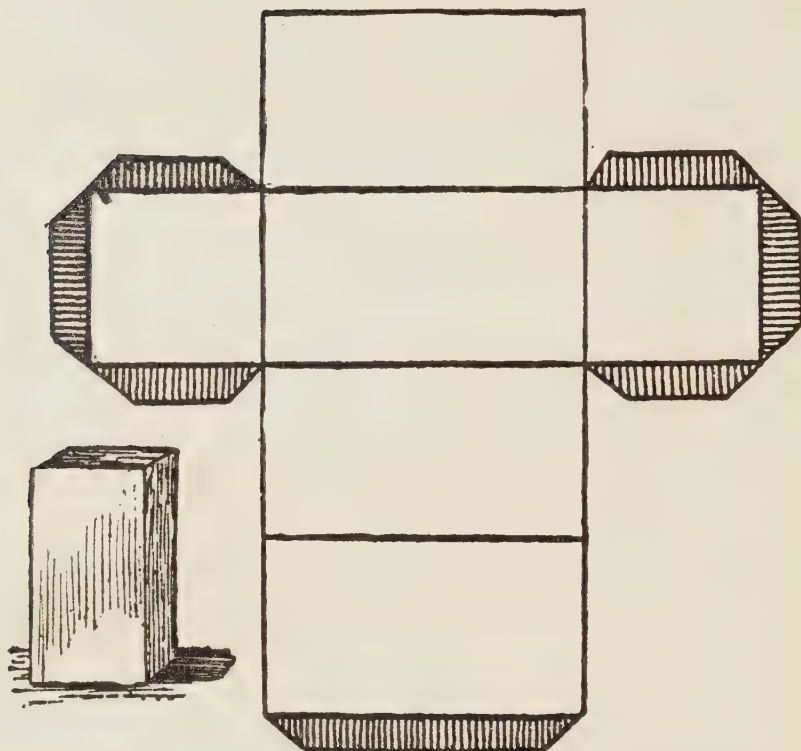
The Square Prism.

Fig. 121

The square prism is made in the same manner as the cube, the only difference being the relative size of the squares and the rectangles. These of course should be made to correspond with the faces of the prism.

The Cylinder.

The curved surface of the cylinder is represented by the rectangle, the shorter side of which is equal to the height and the longer side to the circumference.

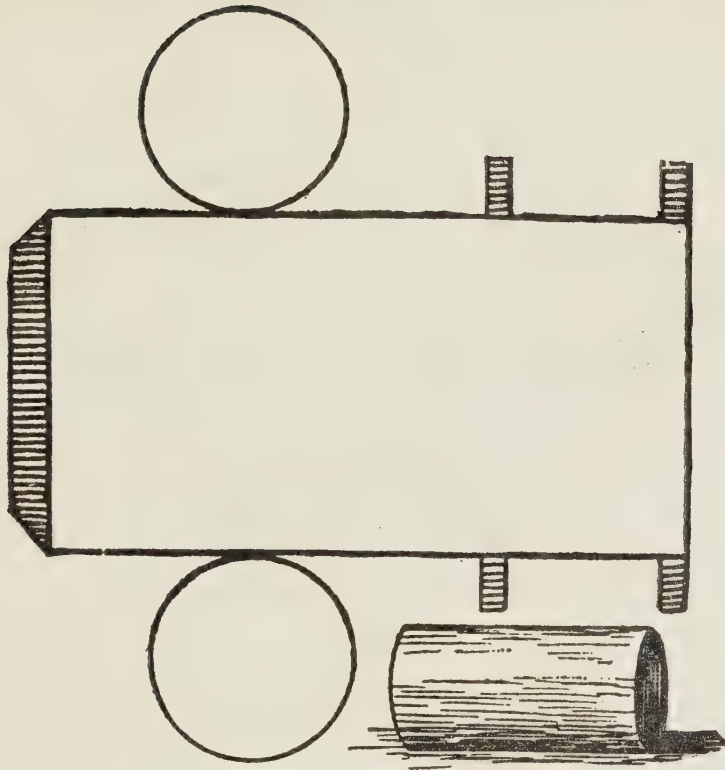


Fig. 122

The Triangular Prism.

The central rectangle represents the base ; the other two the slanting surfaces. The two triangles which represent the ends should be made exactly the same size. If the prism is a right-angled triangular prism, the triangle should of course be right angled. (Fig. 123-4.)

The Square Pyramid.

The four triangles represent the four triangular faces. They should be of exactly the same size. The square represents the base. (Fig. 125.)

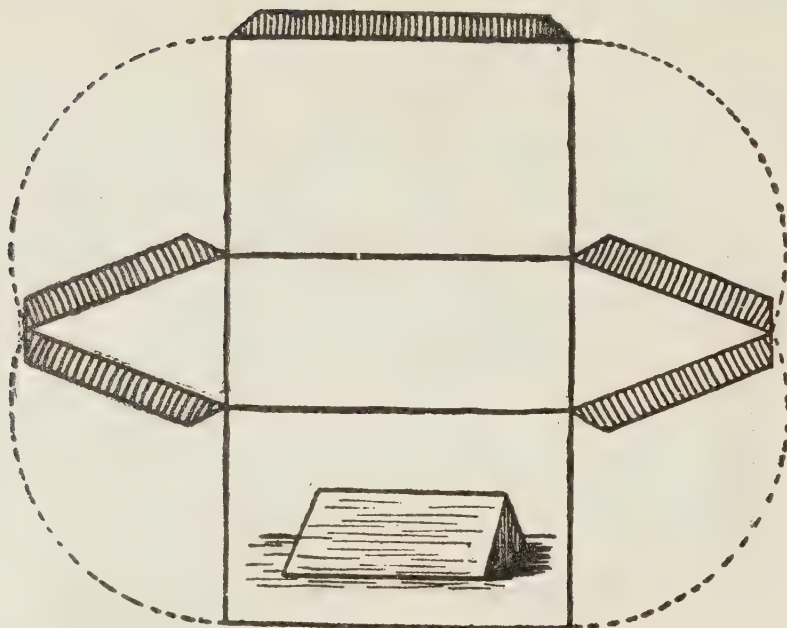


Fig. 123

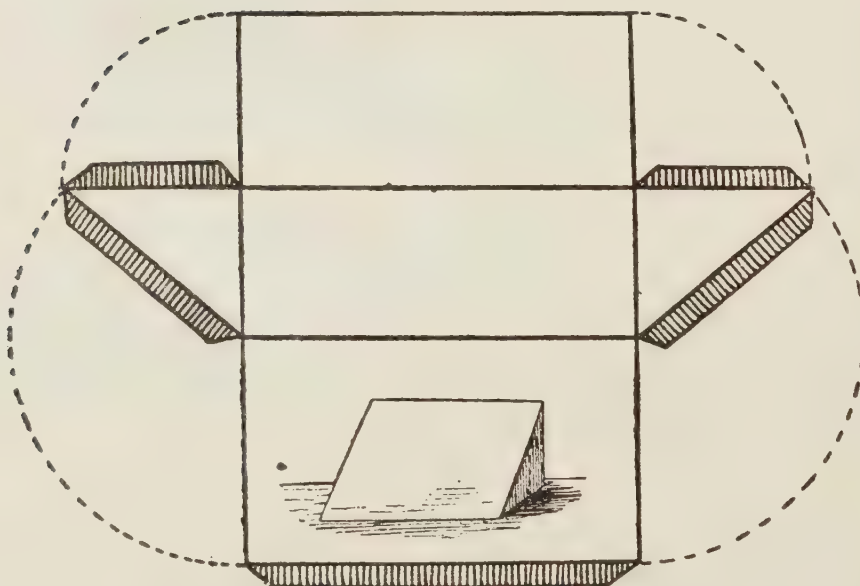


Fig. 124

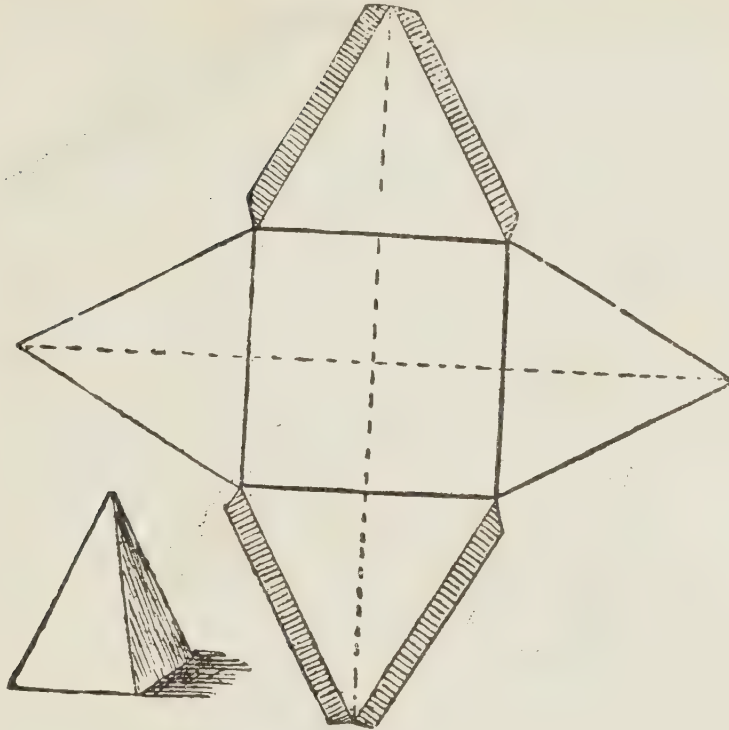


Fig. 125

The Cone.

The circle represents the base. The curved side of the upper part of the figure must be the same length as the circumference of the circle. (Fig. 126.)

5. Models—Solids.

Use the cube, sphere, spheroid and ovoid.

We desire to again impress the fact that object drawing is the representation of objects, not as they *are*, but as they *appear* when viewed from a certain point. The cube, for instance, has six faces, but place it in any position and three are all that can be seen at the same time, and it may be so placed that two or only one may be seen at the same time. Many entirely different pictures therefore may be made of the same object. *Draw only what is seen at one time.*

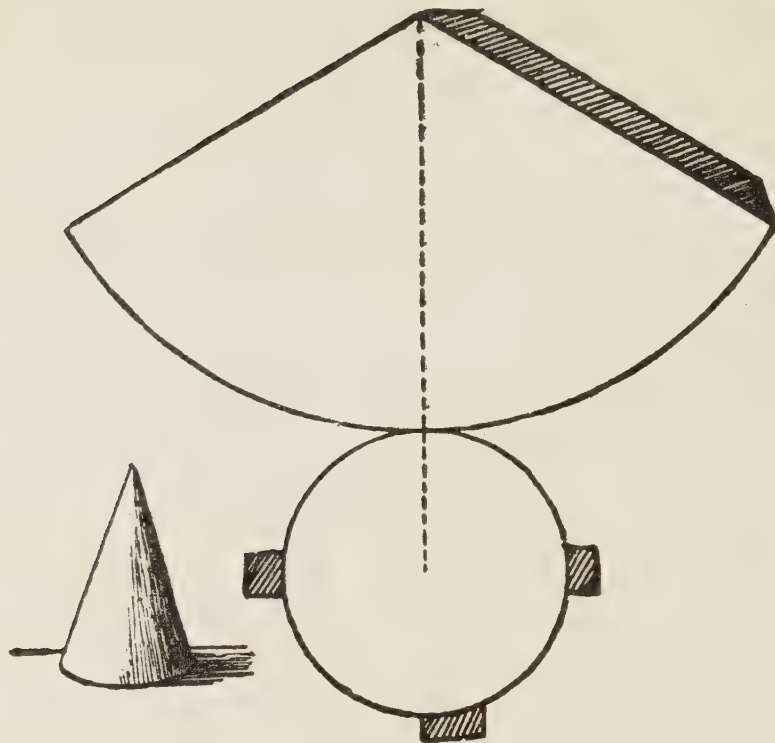


Fig. 126

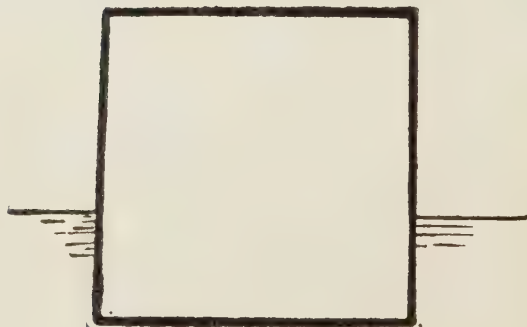
The Cube.

Fig. 127

Place the cube squarely in front and on a level with the eye. Pass the pencil round the limits of the visible part. Represent it by a square. In

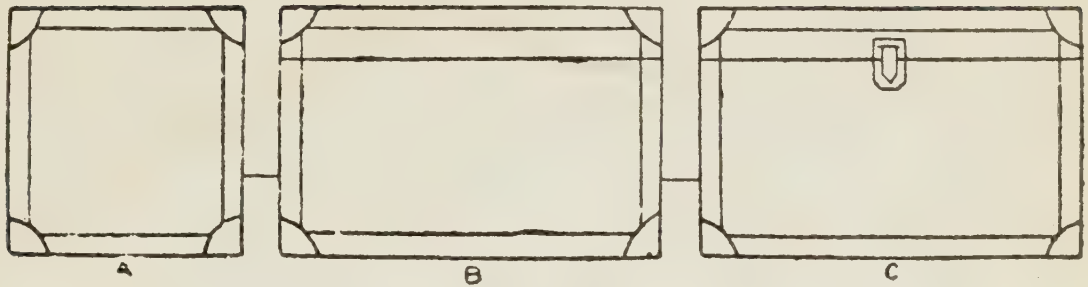


Fig. 128

fact it *appears* exactly as the square tablet when held in the same position. Truly it is an entirely different object. Previous or present knowledge, however, should not be the guide now.

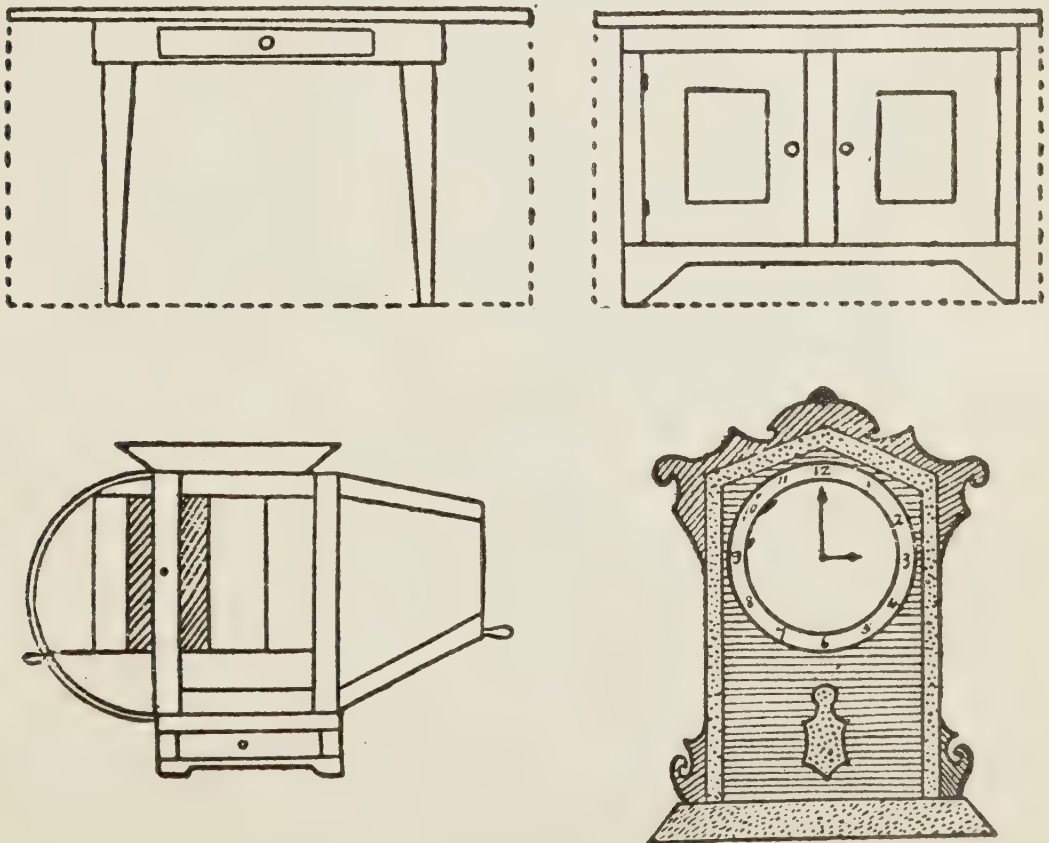


Fig. 129

In the same manner outlines of all cubical objects, when in a similar position, are based on the square or rectangle, drawn in proportion to the visible surface. Fig. 129 represents a trunk as it is seen at three different times. In A one end only is visible ; in B the back and in C, the front.

Place such objects as a table, a cupboard, a fanning mill, a clock, a sideboard, a box, a wheelbarrow, etc., in such a position that one side only is visible and draw the outline. See fig. 129.

The Sphere.

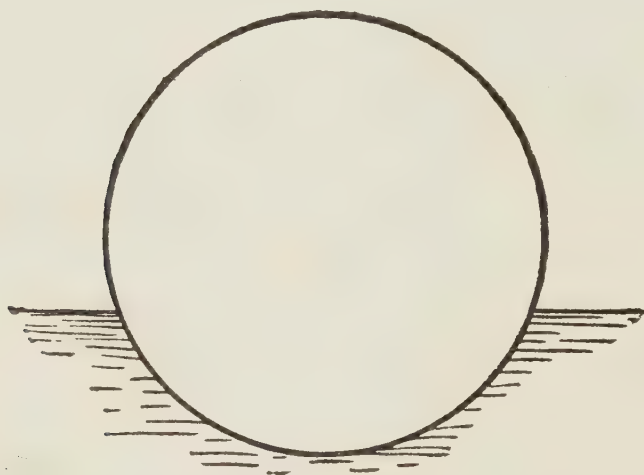
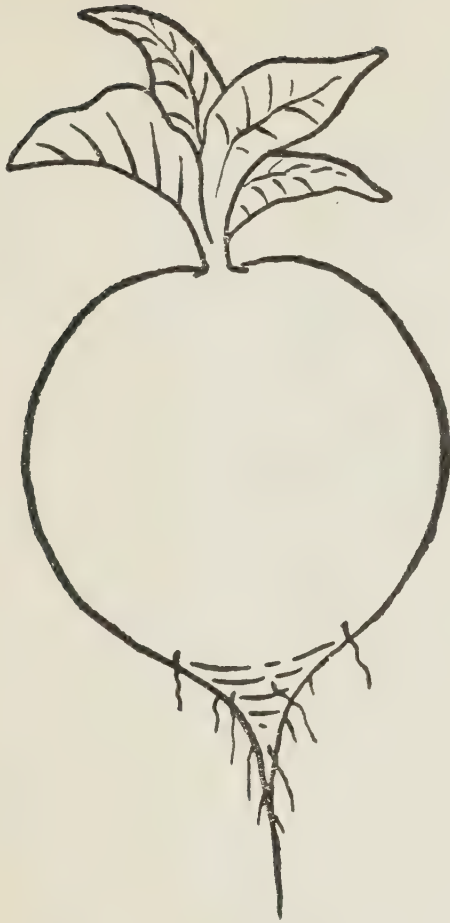


Fig. 130

Pass the pencil round the visible part of a sphere. It describes a circle. All objects such as an apple, a tomato, a ball or a peach, because they resemble a sphere, are said to be *spherical*. The basis of their outline is a circle. It is true the objects mentioned differ from the sphere in points of detail and the outline in many cases, in order to suggest the object, must be modified. Take note of the irregularities which make this difference, and, while the circle is used as a basis, so modify it, that if a hole were cut in the paper round the outline it would allow the object to fit snugly into it.

See opposite page for outlines of spherical objects.



The Ellipsoid.

Fig. 131

The Ellipsoid, when the side is visible, is represented by an ellipse. This ellipse becomes shorter, as the end is turned towards you, until it becomes a circle. An object similar in form to the ellipsoid is said to be *elliptical*. Two examples are shown in fig. 132.

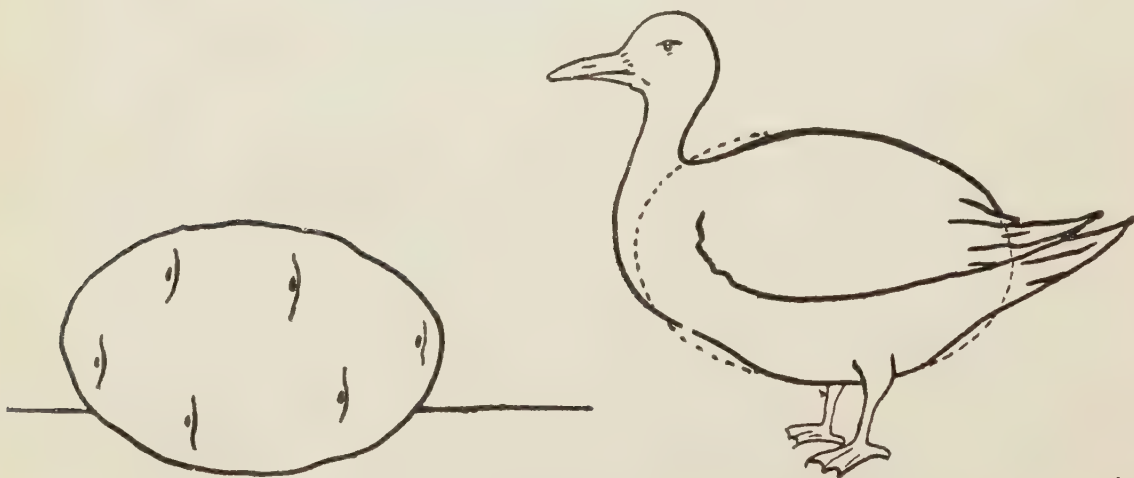


Fig 132

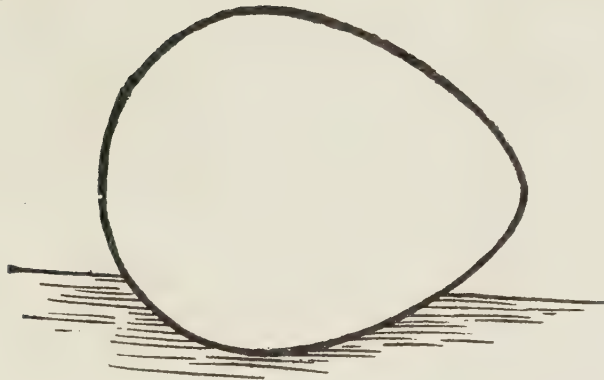
The Ovoid

Fig. 133

The Ovoid is represented by an oval which is the basis of all objects of this class. A pineapple and a pear are shown in fig. 134.

Memory Exercise.

Sketch a circle. Recall the image of some familiar object. Think carefully over any peculiarities of form it may possess. Examine the mental image as carefully and in the same manner as the original object would be examined. Use the circle as a basis and sketch the outline (page 141).

Follow the same method with the square, ellipse or oval.

Repose.

An object is said to be in repose when it rests upon something. This something may be a table, a board, the ground, etc. To suggest this, draw a horizontal line a little above the lower part of the outline. This line will represent the farther edge of the support.

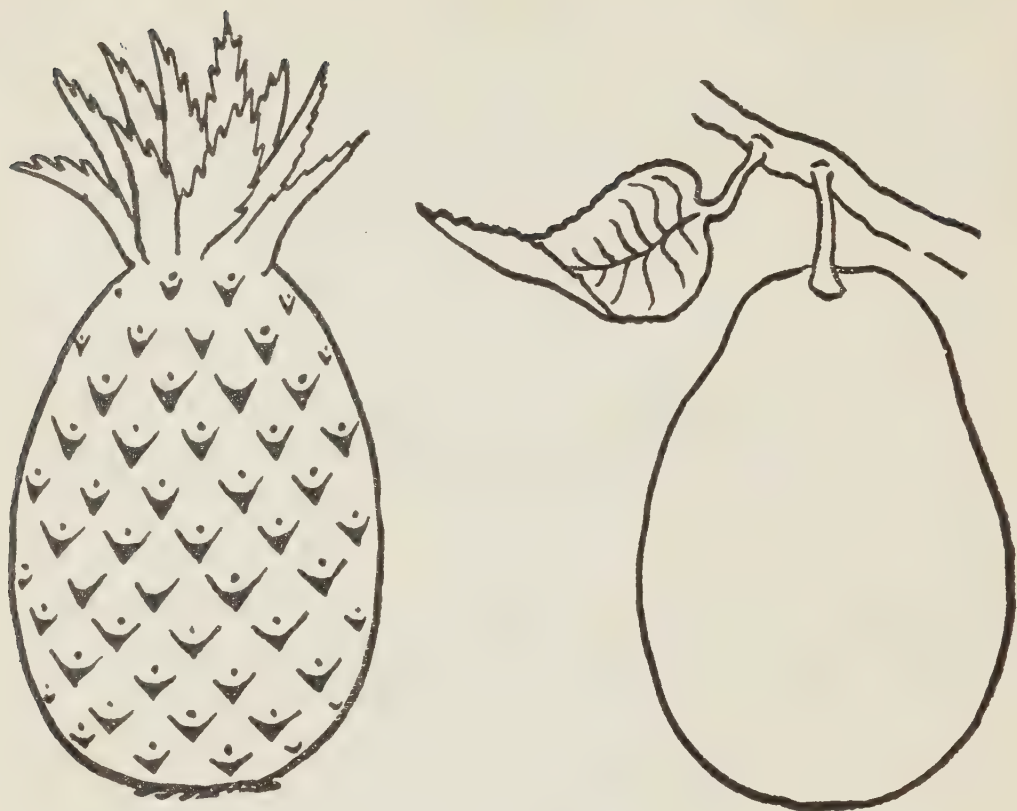


Fig. 134

The same effect is produced by representing the shadow, as this in itself will suggest the idea of a support.

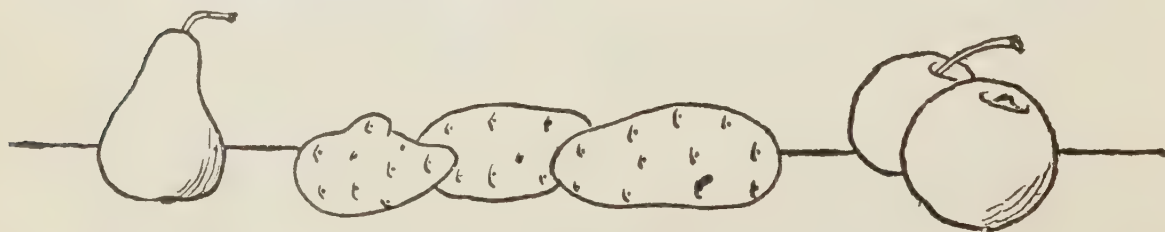
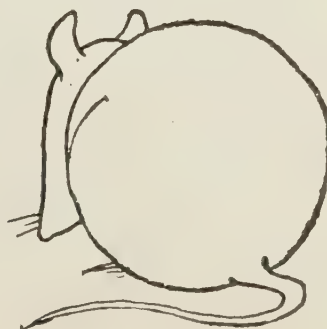
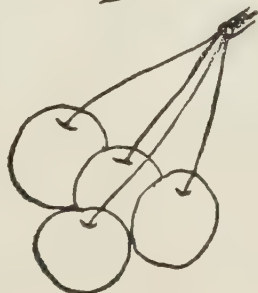
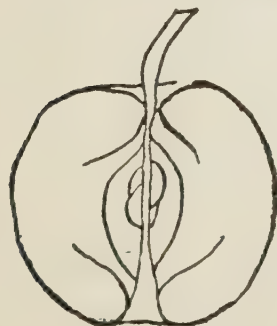
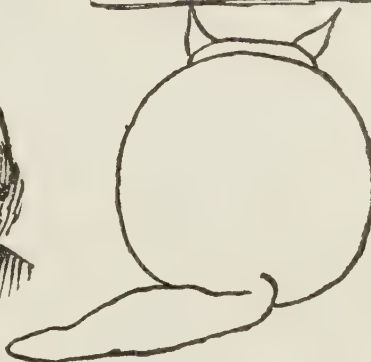
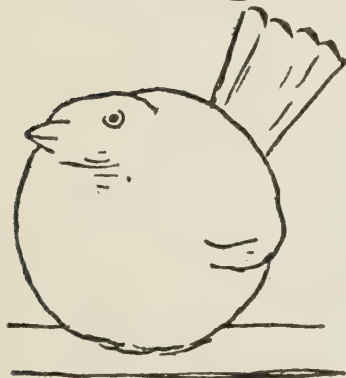


Fig. 135



6. Effect of Distance.

Hold the pencil as indicated in fig. 136, at arm's length, and perpendicular to a line from the eye to the object. Move the hand so that the point of the pencil is in a direct line with the eye, and one end of a desk in front. Slide the thumb along the pencil so that it will mark a point in line with the eye, and the other end of the desk. The distance thus marked represents the apparent length of the desk.

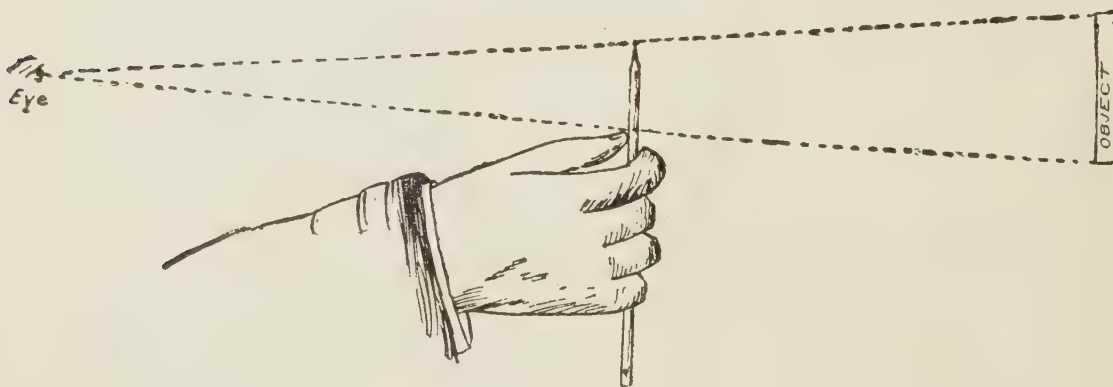


Fig. 136

Repeat the experiment on another desk of the same size and in the same position, but standing nearer to you. The distance now indicated represents the apparent length of the second desk.

Compare these apparent lengths.

Measure, in the same manner, the apparent size of any object at any distance from the eye. Move the object farther away and measure again. Compare the measurements taken on the pencil. What caused the difference? The pencil was, in both cases, held the same distance from the eye. The distance between the eye and the object must have been the cause.

The conclusion then is that *the apparent size of an object will vary with the distance the object is away*. The farther away, the smaller an

object will appear. Objects of the same size, but at different distances, will appear different. Those farther away appear smaller than those which are near.

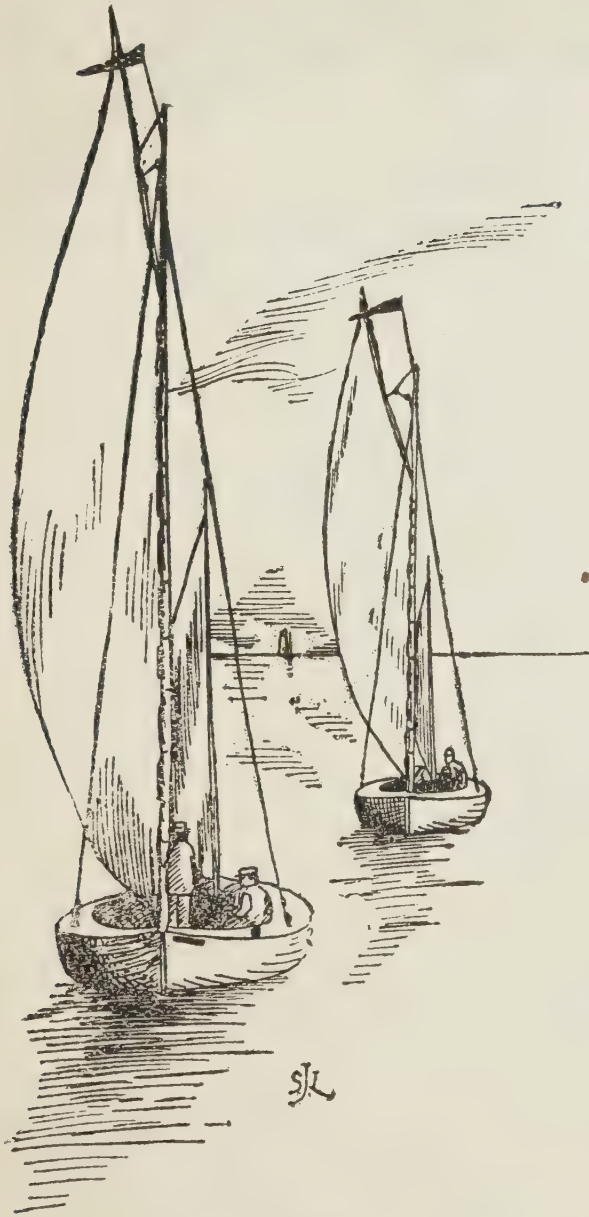


Fig. 137

Fig. 137, copied from a photograph of three yachts, illustrates this point very clearly. It is known that these yachts are all of the same size, and that the masts are all of the same height; yet, by comparing the actual size of each in the picture a vast difference is noticed. The camera represented them, not as they actually were, but as they appeared at different distances away.

Compare the objects in any good photograph and notice the same point clearly brought out.

Place a number of apples of the same size on the table at different distances from the eye. Compare their apparent size very carefully and note the result.

7. Effect of Position.

Hold a square tablet in a vertical position directly in front of the eye. Measure the height and width as directed in section 6.

Compare the measurements taken. They are the same. Tip

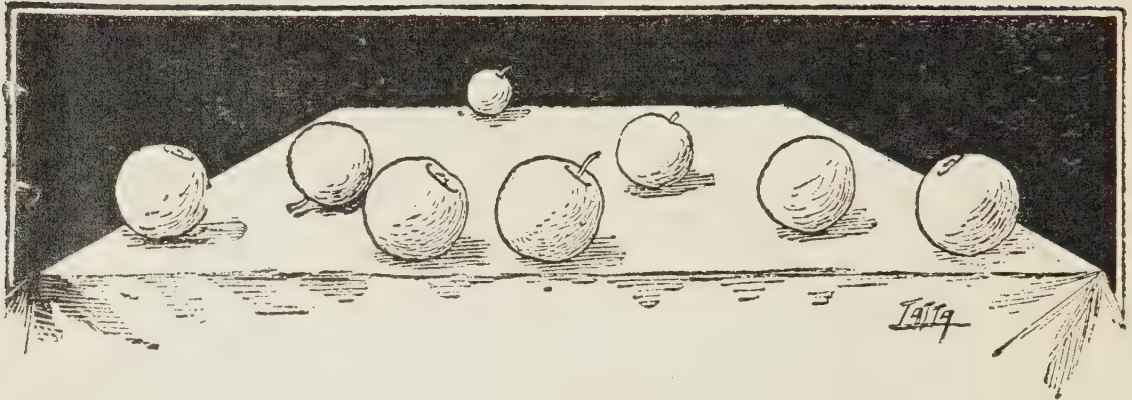


Fig. 138

the tablet slightly back from the vertical, measure and compare as before. The height is now less than the width. Continue to tip it back until it finally appears as a straight line. See fig. 139.



Fig. 139

Again place the tablet in its former position. Turn it gradually to the right or left. Compare again. What is the result? See fig. 140.



Fig. 140

Hold the model in any position and compare the apparent width with the height. Change the position and compare again. What is the result?

Thus it is seen that not only distance but position will change the appearance of objects very much. In fact, accurate drawings cannot be made unless distance and position are carefully considered. The appearance of an object will change with every change of position, so that if the result desired is an interesting picture, that position which will best illustrate the most interesting characteristics should be chosen. If, on the other hand, the aim is to develop the power and habit of seeing intelligently, choose a position which is not familiar as this will compel the closest attention.

In fig. 141 eight positions of a book are shown, yet this number is comparatively small when compared with the very many positions in which it may be placed.

8. Foreshortening.

We believe it is safe to say, that because an illustration looks right to the cultivated eye, it is drawn correctly. We assume then that fig. 142 is a correct drawing of a cube for the reason stated.

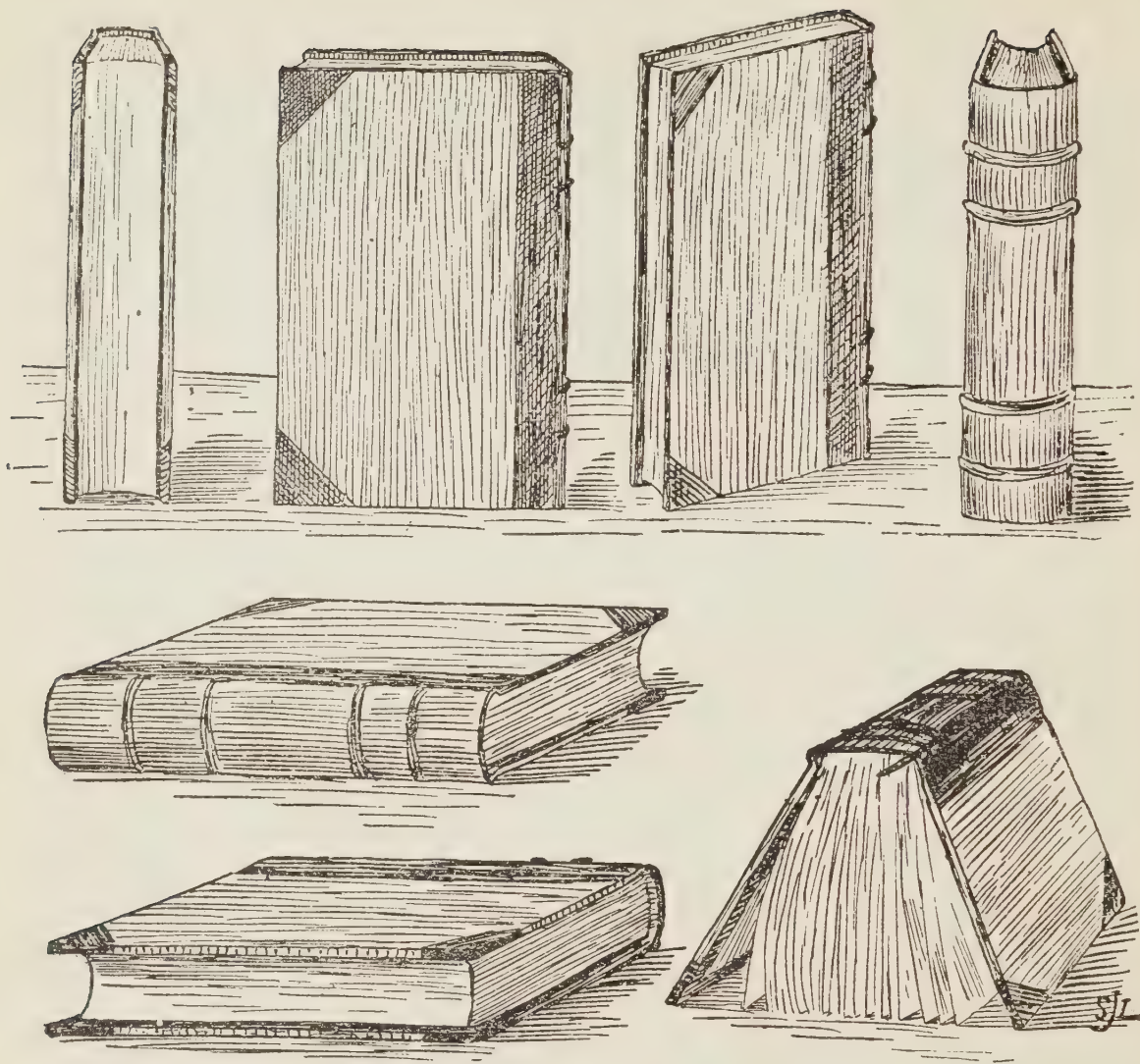


Fig. 141

By actual measurement of the edges in the picture, it is found that they are of different lengths, while the edges of a cube are all of the same length. The representation of edges or surfaces, as they appear when not extended directly in front of the eye, is termed *foreshortening*. This is one of the greatest difficulties in object drawing, and constant care is necessary in order that foreshortened edges or surfaces be accurately represented.

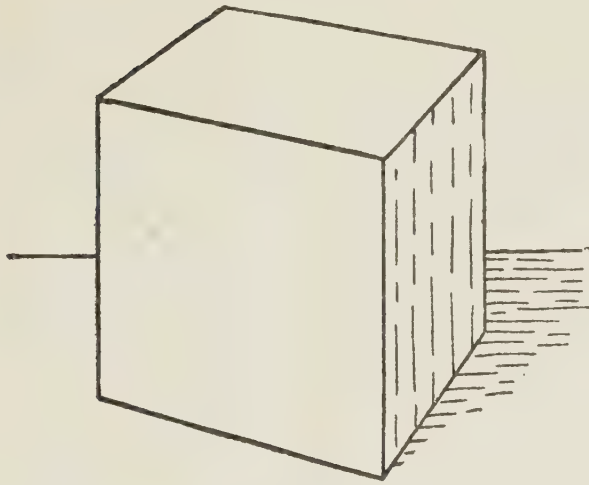


Fig. 142

Think of an object when sketching its outline as if it were being traced on a transparent plane held between the eye and the object. There is no better way of becoming convinced of this than to hold a piece of glass between the eye and some object, and tracing the outline on the glass.

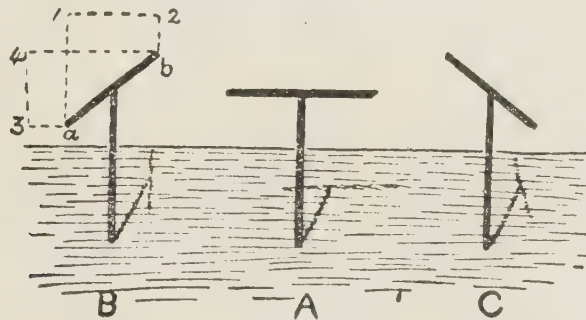


Fig. 143

A good model for this experiment is a T stick made of two pieces of wood about 18 inches in length. This model should be placed in different positions and traced as we have suggested.

The drawing paper represents this transparent plane. Draw on it in the same manner as the tracing is done on the glass. In order to do this, think of the relative position of a point as being to the *left* or *right* of, *above* or *below* some other point, the position of which has been indicated. Measure at first as outlined in section 7. After some practice however, this will be unnecessary, except as a means of testing work done.

The eye becomes so trained that distances can be fairly judged without measuring. In sketching outlines, of the T square for example, try to think of *a* as being to the *left* of *b*, as far as 1 is to the left of 2, and below as far as 3 is below 4. See fig. 143.

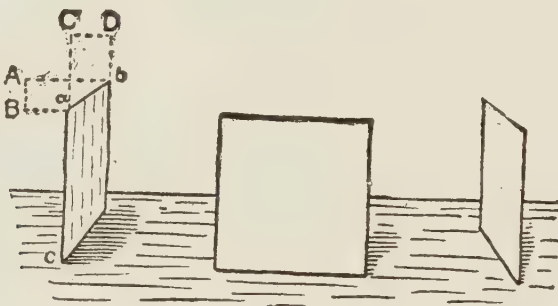


Fig. 144

The same principle may be applied to the drawing of any object when any part is foreshortened. In the illustrations of the tablet, fig. 144, *a* is to the *left* of *b* as far as C is to the *left* of D, and *a* is below *b* as far as B is below A.

Cut a piece of dark-colored card-board, about an inch in width and 6 inches long. Place this model as suggested in fig. 145, on the desk a couple of feet in front. Make an outline drawing of the model as it appears from where you are sitting.

A plumb line, made of a white piece of string and a light weight, if held between the eye and the object will aid in fixing the relative position of points.

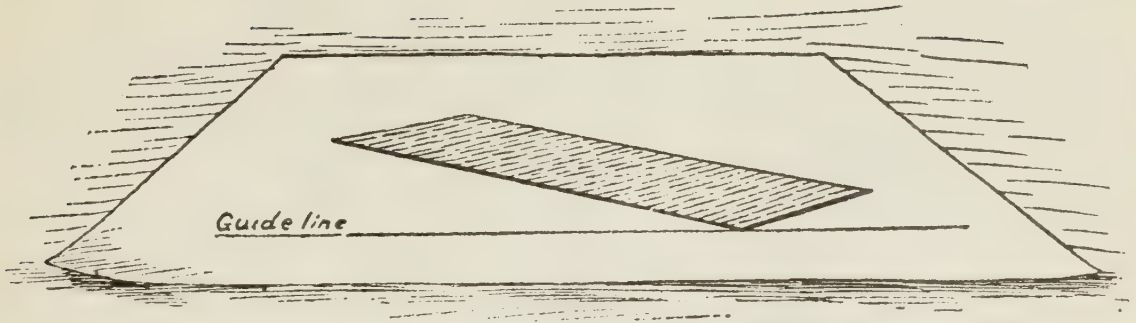


Fig. 145

Care must be taken to make all measurements when the pencil is at the same distance from the eye. To make sure of this, fasten the pencil by a piece of s'ring to the coat and take all measurements when the string is taut.

To aid in seeing the model more clearly, it is a good plan to lay it on a sheet of white paper.

As a guide, sketch a horizontal line across the paper so that it touches the nearest corner. Sketch another in a similar manner on the drawing paper. Choose a point A to represent the nearest corner of the tablet. Measure the distance the corner B is to the left of A. When taking this measurement hold the pencil horizontally, and at right angles to a line from

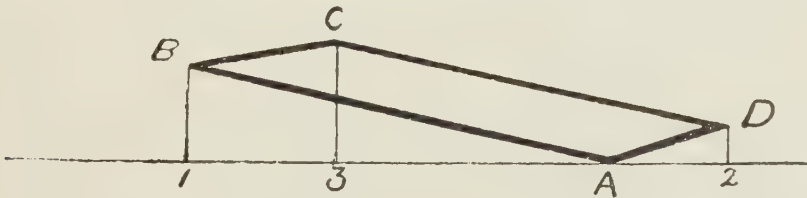


Fig. 146

the eye to the object. Mark this distance (A to 1), on the guide line to the left of A. The distance from A to 1 will determine the size of the drawing, as all other distances are measured in proportion to it. Hold the pencil vertically to measure the distance B is above the guide line. Indicate this

by sketching a line perpendicular to the guide line and above it. The left corner is A to 1 to the left of A, and 1 to B above A. In the same manner mark the positions of all other corners. D is A-2 to the right, and 2-D above A; C is A-3 to the left, and 3-C above A. By joining these points by straight lines the outline is completed.



Fig. 147

Fig. 147 further illustrates this principle and shows its application to the drawing of a group of leaves.

The subject of foreshortening is further dealt with, in the sections on perspective. There is this, however, that we desire to emphasize: while the principles, outlined in sections referred to are necessary, success will largely depend upon ability to think of prominent points in an object as being to the *left* or *right* of, *above* or *below* some other point already indicated.

The best objects to use as models for first practice are those having prominent points indicating the meeting of edges or surfaces. See fig. 148 and fig. 149.

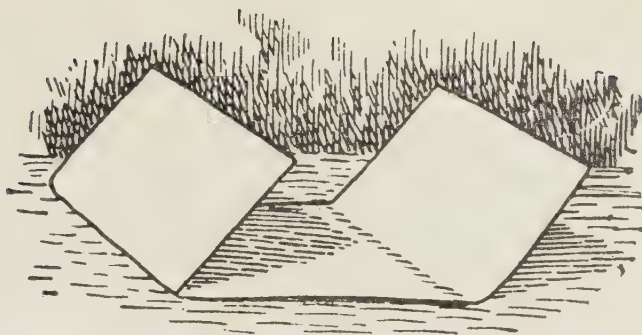


Fig. 148

Problems.

1. Draw a garden rake ; (*a*) as it appears when lying on the ground, handle to the right ; (*b*) hanging on the wall so that the head is above the eye, handle pointing down ; (*c*) leaning against the wall, head down.

2. Draw a hoe in five different positions.

3. Draw the following :

(*a*). A folded piece of paper in three different positions.

(*b*). An envelope lying on the table, one corner pointing towards you.

(*c*). A twig of maple leaves.

(*d*). A chair.

(*e*). A pair of scissors in three positions.

4. Draw a hoe in four positions.

5. Sketch the outline of an open umbrella, placed in such a position on the floor that the handle is visible.

6. Place the following objects in different positions and draw them :

1. A knife.

4. A door.

7. A slate.

2. A scythe.

5. A stove-lifter

8. A spoon.

3. A wrench.

6. A hat.

9. A hair-brush.

7. Draw a wheel-barrow from memory, as it would appear when viewed from the side and below the eye. Compare the drawing with the object in this position.



Fig. 149

8. Show the outline of each foreshortened face of a cube.
9. Draw the left side of the room in which you are sitting.
10. Sketch the outline of as much of the ceiling as is visible at one time.

9. Insects and Animals.

The drawing of insects and animals, besides affording a great deal of pleasure, will play a most important part in the development of accurate observation. We know of at least one person who could not say positively how many legs a grasshopper had until the insect was examined for the purpose of making a drawing of it. Here then is one application of the Scriptural truth "Hear ye indeed, but understand not ; and see ye indeed, but perceive not."

We shall outline but three methods that may be followed.

1. Secure such specimens as are available and draw directly from these.
2. Draw from memory, and as soon as the opportunity presents itself compare the drawing with the object.

3. Examine the object critically, and if possible make a rough sketch or take written notes of prominent characteristics, after which the drawing may be made from memory.

The dragon-fly is an excellent specimen to begin with. Pin it to a white piece of card-board. Place it in a vertical position in front so that what may be called a symmetrical view is obtained. The card will act as a white background and enable the outline of the insect to be clearly seen.

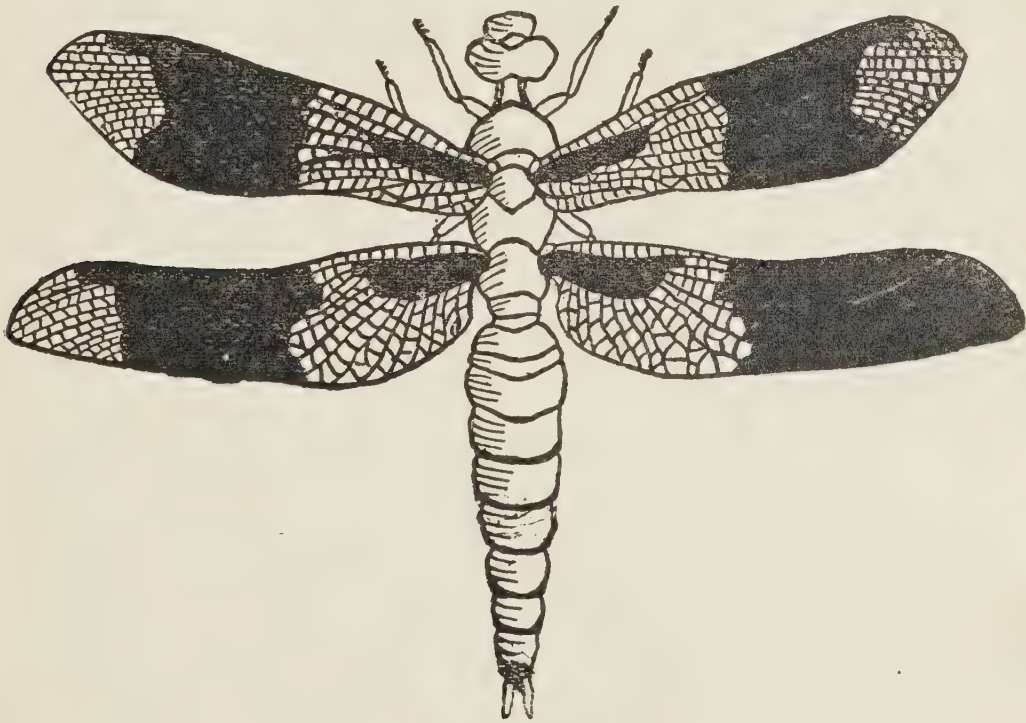


Fig. 150

Success will largely depend upon making a thorough examination before beginning to sketch. Get a clear conception of the general outline and the most prominent characteristics. It is almost completely symmetrical, that is, if it were cut in two parts, and the left half turned over on the right, it would practically coincide. This is true of almost every insect when seen in this position. Sketch a vertical line to form the axis of the outline. Upon

this line indicate the greatest length to make the drawing. This will be the measuring unit and all other parts should be made in proper proportion to it. Mark off the part of the whole length to be required for the head ; then the shoulders, wings and lower part of the body. Sketch vertical lines to mark the greatest width in proportion to the length already decided.

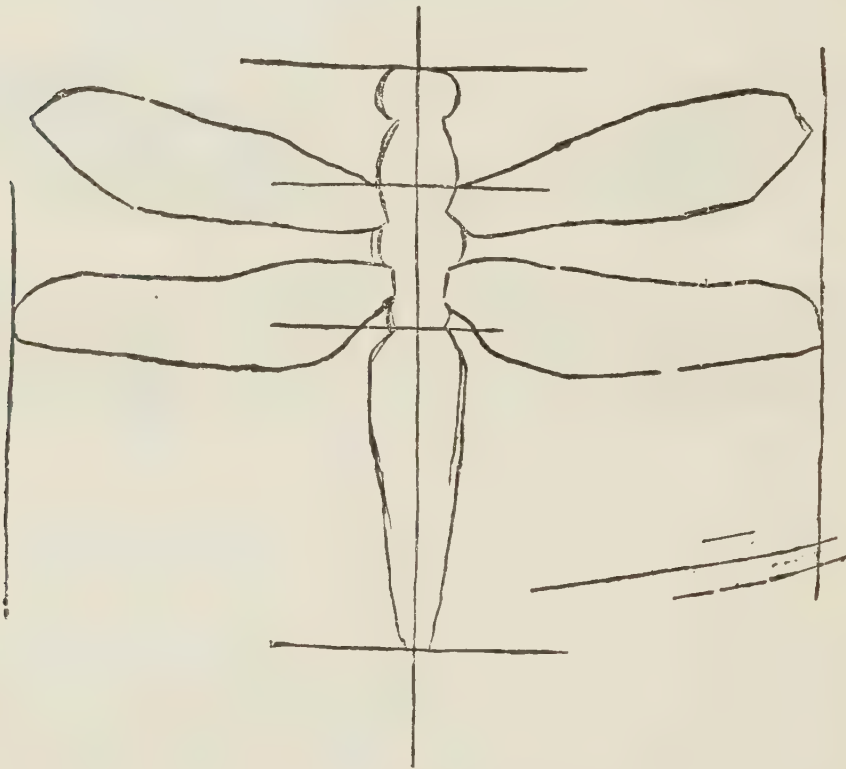


Fig. 151

If this much has been done carefully, little difficulty will be found in sketching the detail. Do not sketch the whole of one side before commencing the other. Sketch the outline of both sides of the head first ; next the different parts of the body bringing each side along together. Outline the first wing on the left side ; then the first on the right, etc.

Compare the outline with the original, and, if no changes are thought necessary, line in.

The insect should not be placed in such a position that any of the parts are foreshortened until there has been much practice in drawing it from a symmetrical view. See the grasshopper in fig. 152.

Animals, unless stuffed specimens are procured, must of necessity be done from memory.

After fair proficiency in drawing individual subjects has been attained, practice grouping. A very interesting group is shown in fig. 153.

Problems.

1. Draw a cat drinking from a small dish.
 2. Draw a dog lying on a mat.
 3. Sketch the outline of a duck and five ducklings.
 4. Draw a grasshopper lying on its back as if dead.
 5. Show a symmetrical view of a common house fly.
 6. Make a nicely-shaded drawing of a squirrel cracking a nut.
 7. Draw a group of three rabbits.
 8. Compare the height of a horse with its length from tip to tip. What is the proportion? Draw the horse.
 9. How many stripes of color are on an ordinary caterpillar? Draw it.
 10. Draw a beaver.
 11. Draw a group of three cows.
 12. Show the outline of a cow's head as if she were drinking from a trough.
 13. Make the necessary notes for a memory sketch of a bear.
 14. Draw an elephant.
 15. Sketch, from some good copy, the outline of a lion.
- For other groups see *Drawing from the flat*.

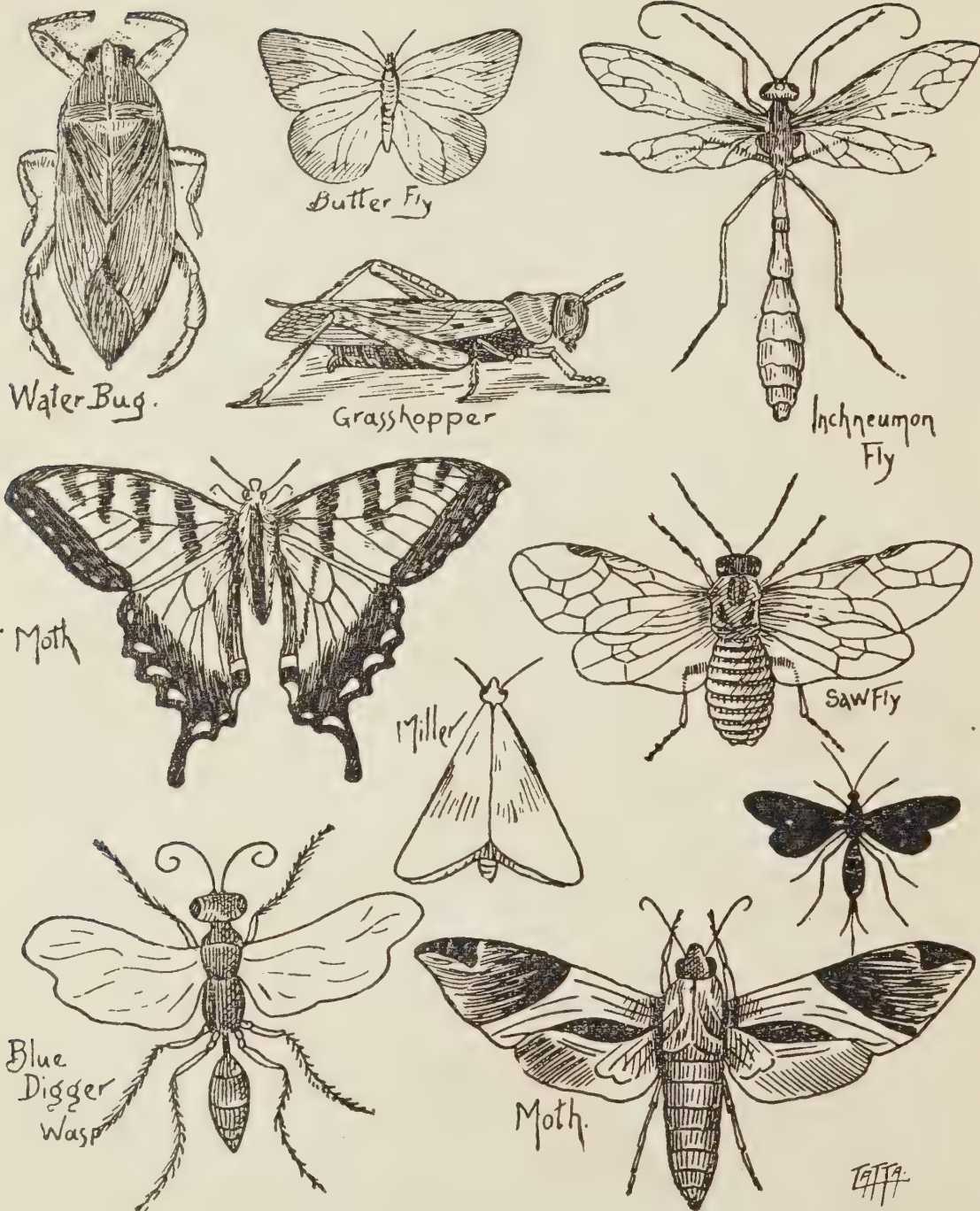


Fig. 152



Fig. 153



Fig. 154



Fig. 155

10. Leaves, Flowers and Plants.

Drawing from leaves, flowers and plants should be done during the spring, summer and autumn months, when specimens are easily obtained. It is not always advisable to draw directly from the object when fair profici-



Fig. 156

ency has been attained. After an object is drawn from memory, however, comparison should always be made with the object or a good picture of it in order that inaccuracies may be noted and consequently guarded against in the future.



Fig. 157

Begin by outlining single leaves, then a group of two or three leaves, and lastly the whole plant. Plants with large and few leaves are much more easily drawn than plants with many and small leaves.

Place the object directly in front. Place a sheet of white paper or cardboard to form a white background. This of course may be dispensed with after a time and the plant drawn with appropriate surrounding.

The same general directions as are given for sketching outline will apply here, viz., a careful examination of the whole, comparison of relative position and size of parts, building up the outline by placing the parts together commencing with the more prominent.

The wood violet in fig. 156 may be taken for an example.

Indicate the total height by sketching two horizontal lines, and the width in proportion to the height by vertical lines. Sketch the main stem and the two branches. Mark the position of the leaf points and sketch the leaf stem; then the leaf. Mark the petal points and sketch the flowers. Compare the outline with the object, make any corrections necessary and line in.

A number of leaf outlines are shown in fig. 155. Plants in outline are shown in fig. 158, and in fig. 159 shaded drawings.

Shading should not be attempted until a satisfactory sketch is made.

Problems.

1. Make outline drawings of the following leaves : maple, beech, apple, lilac, sunflower, chestnut, ash, raspberry, violet, dog-tooth violet, mayflower, cherry.
2. Draw a bunch of grapes with leaf attached.
3. Make shaded drawings of the following leaves : maple, chestnut, ash.
4. Draw a wild lily as it would appear when growing.
5. Draw the following buds : rose, apple, wild turnip, geranium.



Fig. 158



Fig. 159

11. The Circular Tablet, Cylinder and Cone.

The Circular Tablet.

By the same method of measuring with the pencil at a fixed distance from the eye, notice :—

1. That, when a circular tablet is held directly in front, the horizontal and vertical diameters appear the same length. The tablet appears as it really is—a circle. (Fig. 160.) Read first principle in *Parallel Perspective*.

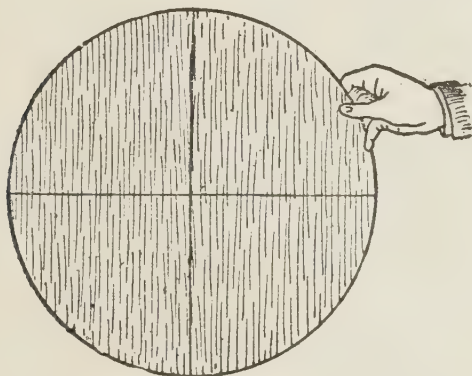


Fig. 160

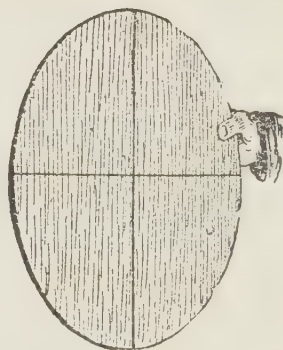


Fig. 161

2. That, if the position is changed by turning it to the right or left, the horizontal diameter is foreshortened while the vertical diameter appears as before. In this position it may be represented by an ellipse which becomes narrower the farther the tablet is turned from the original position, finally becoming a vertical straight line. (Fig. 161.)

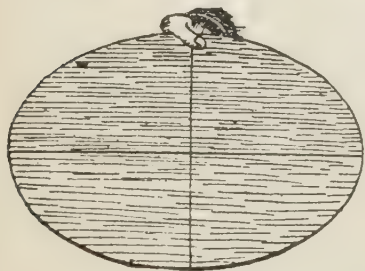


Fig. 162

3. That, if the position is again change by tipping the top backward and the bottom forward, the vertical diameter is foreshortened and the horizontal diameter appears as before. It may be represented, when in this position, by an ellipse which becomes narrower as the tablet is tipped farther from the original position, finally becoming a horizontal straight line.

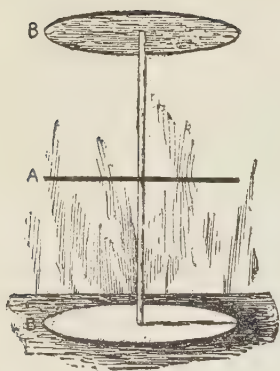


Fig. 163

4. That, if it is held in a horizontal position on a level with the eye (A), it appears a horizontal straight line ; but if lowered or raised (B), the receding diameter is foreshortened. It may then be represented by an ellipse which becomes wider as the distance above or below the eye level is increased. (Fig. 163.)

5. That, if held vertically with edge pointing towards the eye, it appears as a vertical straight line (A) ; but if moved to the right or left (B) it appears as an ellipse which becomes wider as the distance to the right or left is increased. (Fig. 164.)



Fig. 164

Problems.

1. Draw the circular tablet in an oblique position, the horizontal diameter receding.
2. Place the tablet in an oblique position ; both diameters oblique. Draw the ellipse by which it may be represented and indicate the diameters.

A tablet about 18 in. in diameter is the best for class use. It should be made of light colored pasteboard and held in front of a dark background. Vertical and horizontal diameters should be plainly drawn in black.

3. Draw the circular tablet as it appears when lying on the desk in front ; both diameters receding.
4. Place the circular tablet in a slanting position ; one diameter horizontal, the other receding upward from the ground. Draw the ellipse by which it is represented and indicate the diameters.
5. Draw a group of three circular tablets each in a different position.

The Cylinder.

Notice that the end of a cylinder is a circle, that if a thin portion were sliced from the end the result would be a circular tablet, a model in every respect the same as the one just experimented with. Recollect, too, that the circle does not always appear as a true circle, that under certain conditions it appears as an ellipse, wider at some times than others.

An object similar to a cylinder is said to be *cylindrical*.

Place a cylinder in a vertical position and below the level of the eye.

The top surface is really a circular tablet, in a horizontal position, below the eye.

Sketch the horizontal diameter. Measure the foreshortened diameter and sketch it in proportion to the one already drawn. Sketch the ellipse.

The vertical curved surface meets the circular surface at the extreme right and left. Sketch two vertical lines to define the boundaries. Compare the height with the width and indicate the height on the vertical lines.

The base is also a circular tablet, the edge of which is only partly visible. Since this face is farther from the eye level, the ellipse to represent it should be wider. Sketch the diameters and then the ellipse.

Line in visible edges. (Fig. 165.)

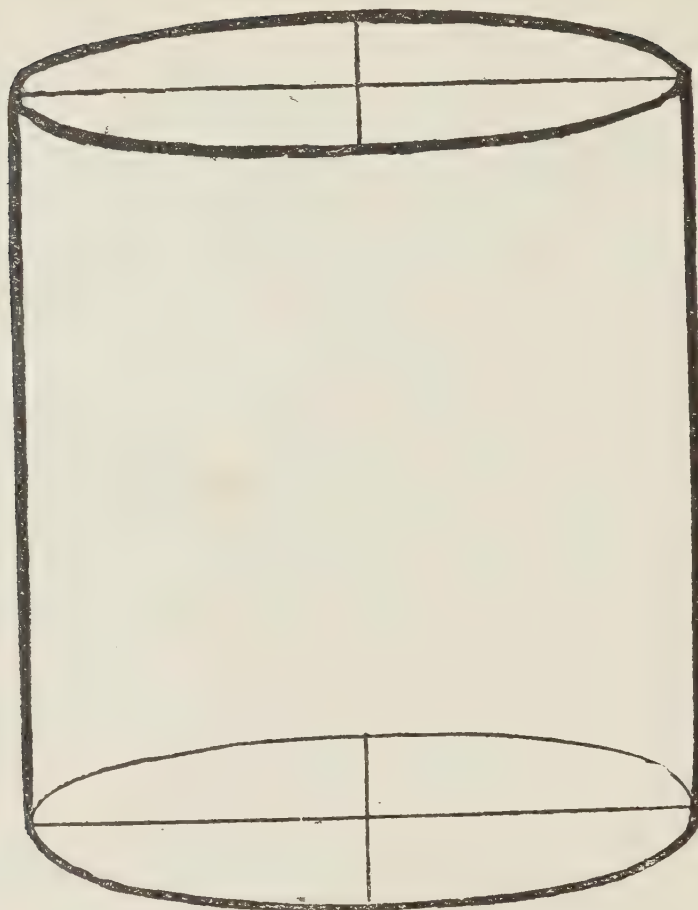


Fig. 165

Place the cylinder in different positions. Draw and compare with fig. 166 and 167.

In fig. 166 three outline sketches are shown. A may be described as to the left ; B, in front ; C, to the right.

To facilitate the taking of measurements of foreshortened diameters, indicate two diameters at right angles and take measurements along these.

A cylinder for class use should be at least 2 ft. long, 1 ft. in diameter and of a light color, the diameters being in black.

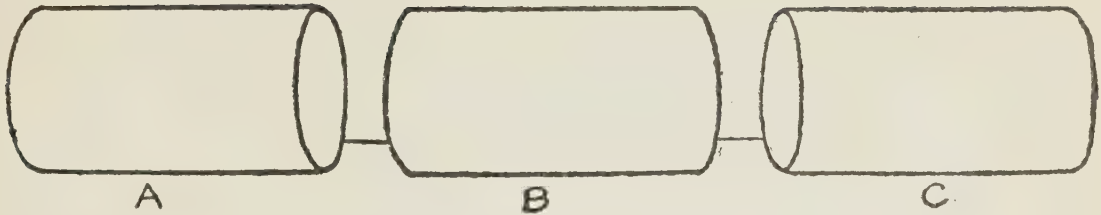


Fig. 166

The greatest difficulty in making drawings like fig. 167 will be to suggest the idea of rest or repose.

Problems.

1. Draw a log in three positions ; length ten times the diameter.
2. Draw a cubical block upon which stands a vertical cylinder ; block below the eye, top of cylinder above.
3. Sketch the outline of an ordinary land roller.
4. Outline an ink bottle in a vertical position.
5. Draw a stump in which an axe is sticking.

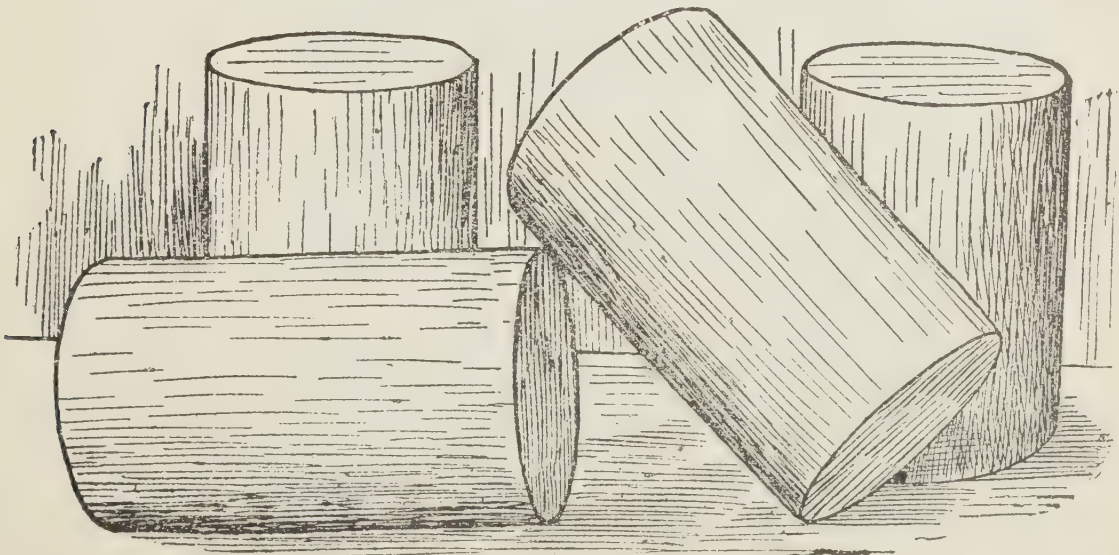


Fig. 167

For other cylindrical objects see page 116. Place these in different positions and draw their outline. Draw others from memory. A teapot, a cup, a sugar bowl, a goblet, a fruit can, a bottle, a post, a barrel, a pail and a link of stove pipe are good examples.

6. Sketch a cylinder in a vertical position; below the eye; height to width as 3 to 2. Show a part cut from the left side. (Fig. 168.)

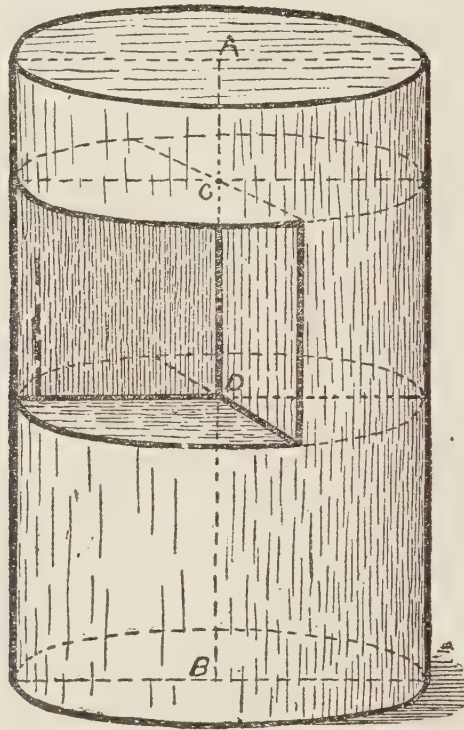


Fig. 168

In problems like No. 6, it is best to work from the centre. Sketch the diameter of each end. Mark the centres, A and B. Join these points by a straight line. Upon this line indicate the length of the piece to be cut away, C and D. With C and D as centres, sketch two cross sections. Through the centres C and D sketch diameters to cut out the part desired. Line in the visible edges.

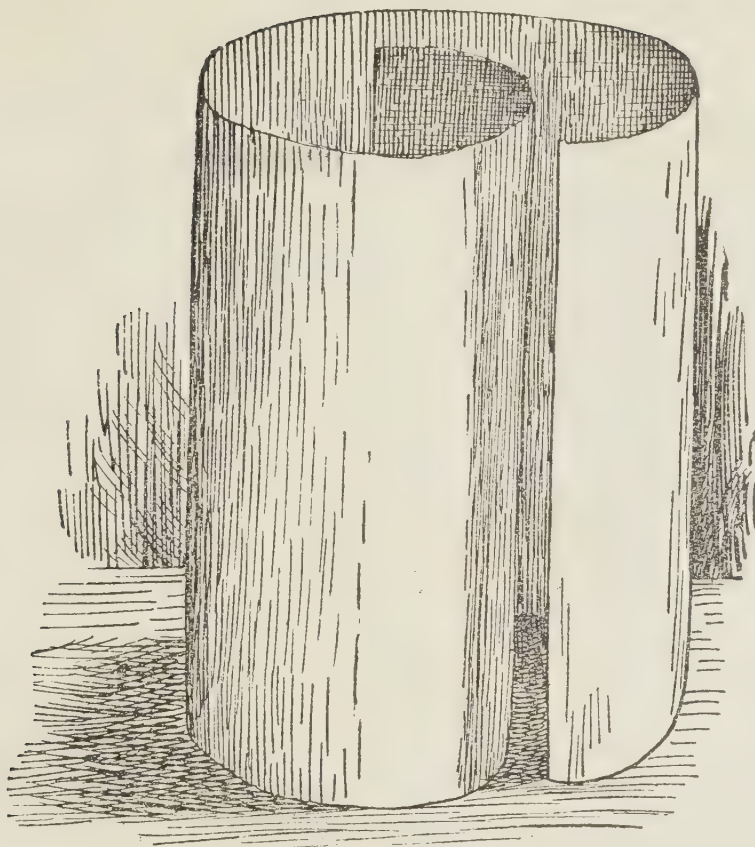


Fig. 169

7. Roll an ordinary sheet of foolscap, place it in a vertical position in front so that the light falls upon it from the right. Sketch the outline and indicate shade and shadow.

Fig. 169, submitted as an answer to problem 7, is somewhat irregular. The principles of this section, however, may be applied.

8. Draw the following :—

- | | |
|---------------------|------------------------|
| 1. A nutmeg grater. | 3. A sap trough. |
| 2. A water trough. | 4. A quarter cylinder. |

9. Draw a half cylinder ; below the eye ; rectangular surface receding at right angles to the picture plane. (Fig. 170 and 171.)

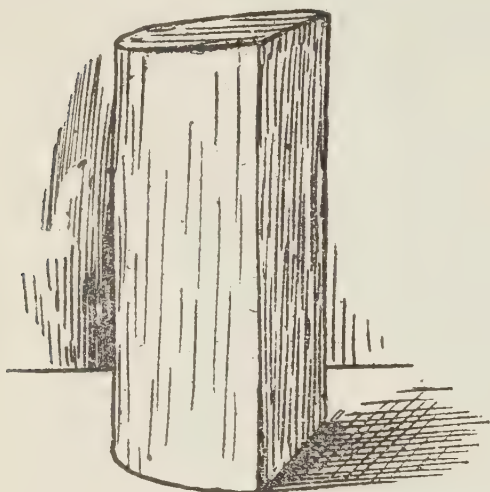


Fig. 170

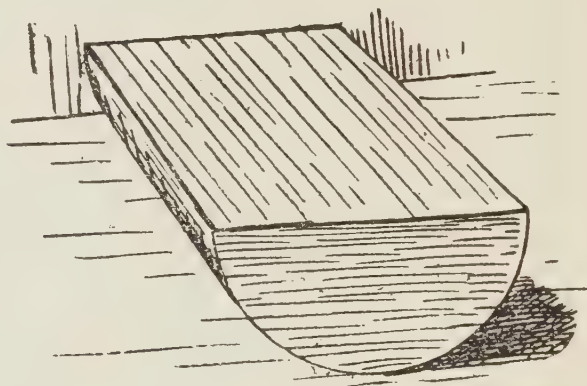


Fig. 171

The Cone.

Fig. 173 shows the construction lines necessary to outline the cone. The apex is directly above the centre of the base when the base is horizontal. The base of the cone is a circular surface and will appear as a circular tablet.

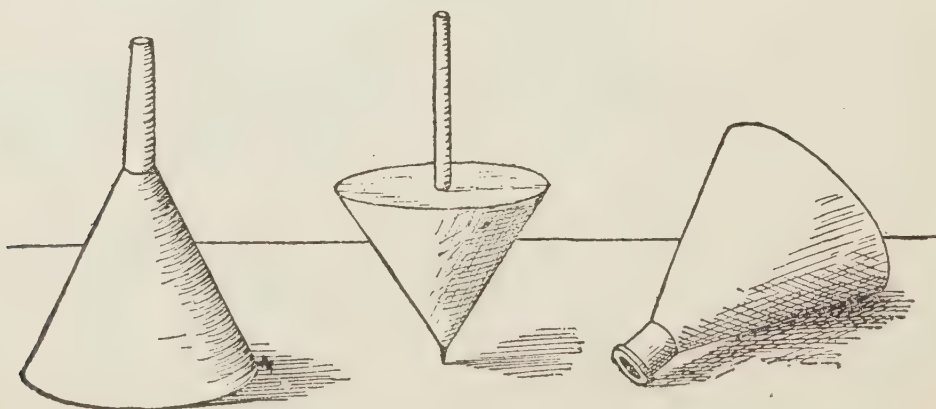


Fig. 172

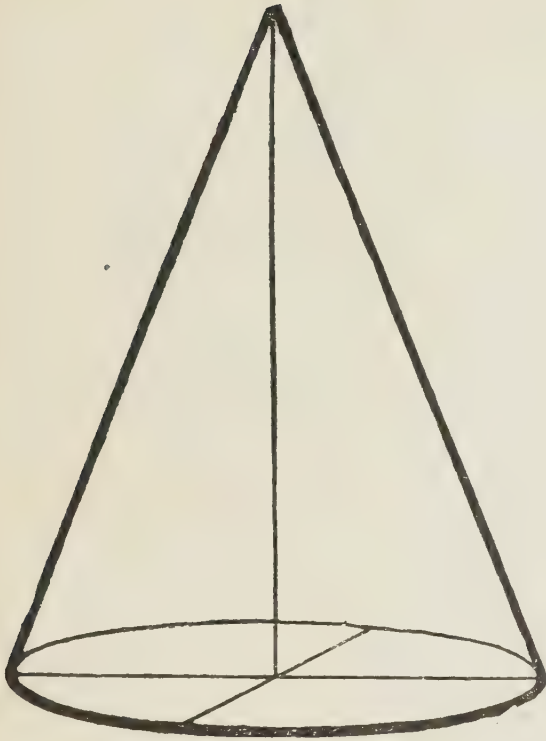


Fig. 173

To show a part cut from a cone, proceed in the same manner as with the cylinder. The necessary construction lines are shown in fig. 174.

Such objects as an ink bottle, a funnel and a top are similar in form to the cone. See fig. 172.

The Hemisphere.

Cut a sphere in two. What is the form of the flat surface?

Draw the hemisphere in different positions. Two positions are shown in fig. 175.

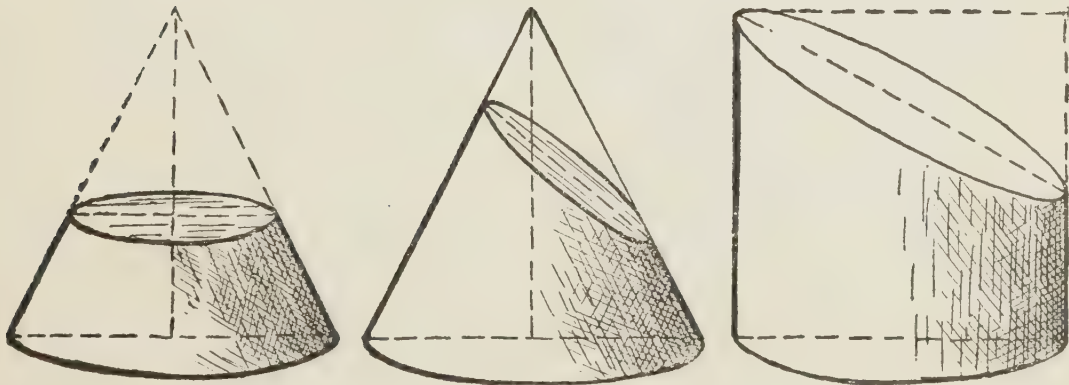


Fig. 174



Fig. 175

Handles.

To show the appearance of a handle attached to a cylindrical object is a most difficult thing to do well. An ordinary saucepan is a good example to begin with.

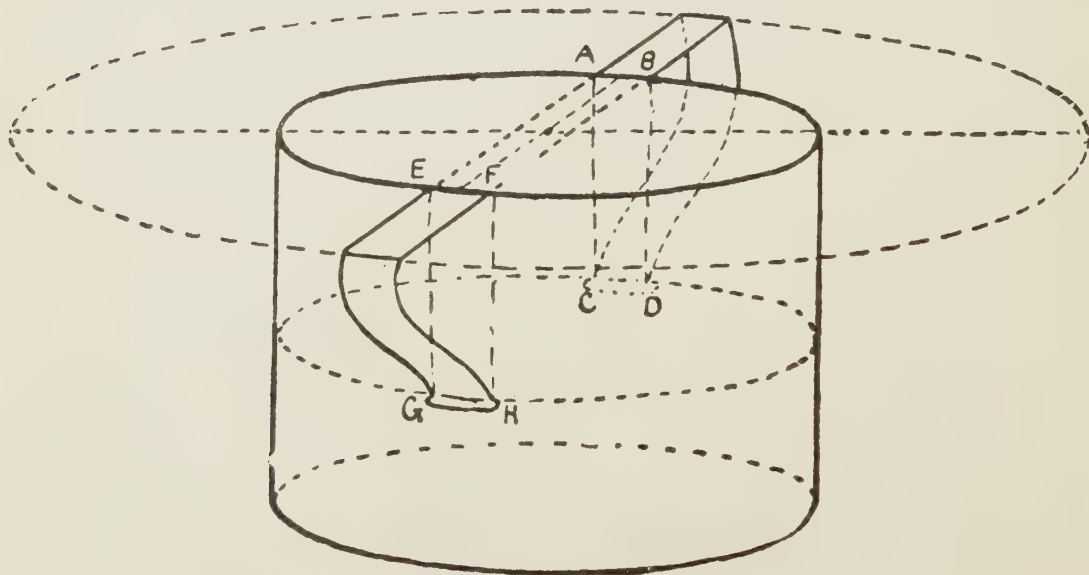


Fig. 176

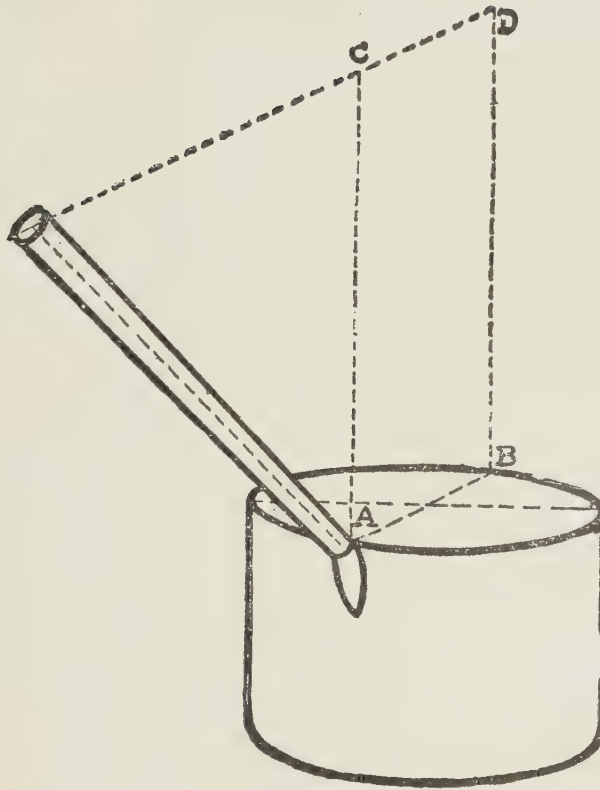


Fig. 177

Sketch the outline. Mark a point on the ellipse at which the handle is to be attached. (Fig. 177.) From this point sketch a diameter of the ellipse. From the points where the diameter meets the circumference (A and B), erect perpendiculars. Indicate, on the nearest of these, the total height from the handle to the ground. If the diameter recedes, a line from this point will converge to meet it. Make DB slightly less than AC. Join DC and produce it towards that side to which the handle is attached. A point marking the top of the handle will be in this straight line. The farther this point is taken from AC the greater slant will be given.

For construction lines necessary, when the handle is on a level with the top, see fig. 176. EG, FH, AC and BD are vertical. EA and FB converge to meet the same vanishing point.

Problems.

1. Draw a cone :—
 - (a) Base below the eye ; horizontal.
 - (b) Base above the eye ; horizontal.
 - (c) Base oblique ; curved surface resting on the ground.
2. Draw a butter dish (circular top) ; below the eye.
3. Draw a plate with vertical wire handle ; below the eye.
4. Draw an Indian wigwam.
5. Draw a tent ; lower part, cylindrical ; top, conical.
6. Draw a saucepan ; handle on the farther side ; below the eye.
7. Draw a wooden pail ; handle vertical ; below the eye.
8. Show the outline of a cup and saucer.
9. Cut an apple in two equal parts. Place them below the eye level and about 3 ft. in front. Draw them.
10. Draw the outline and show the construction lines necessary to fasten a handle to a frying-pan.
11. Sketch the outline of a cylinder as it appears hung from the ceiling above the eye.
12. Draw a group of four cylindrical objects.
13. Draw a lamp.
14. Show the appearance of a cylindrical hole in the ground a few feet in front.
15. Draw three links of stove pipe, one lying across the other two.
16. Show a cone in outline ; one-quarter cut away. (Fig. 178.)

It is not thought necessary to introduce cubical objects in Part III., as the same principles applied to the square tablet will apply to the cube. The cube and cubical objects are fully treated in Part IV.

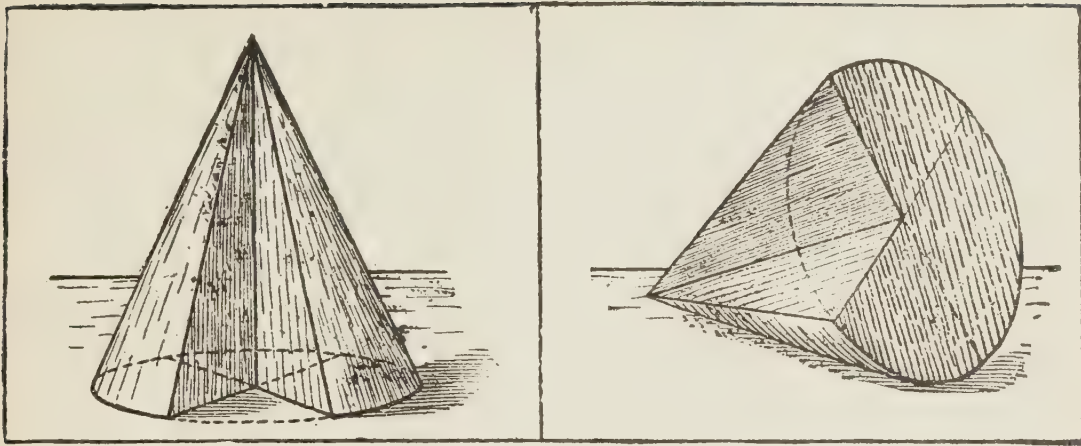


Fig. 178

12. Trees.

The trunk or stem is the foundation upon which to construct the outline. It is usually in a vertical position and the limbs and foliage spring

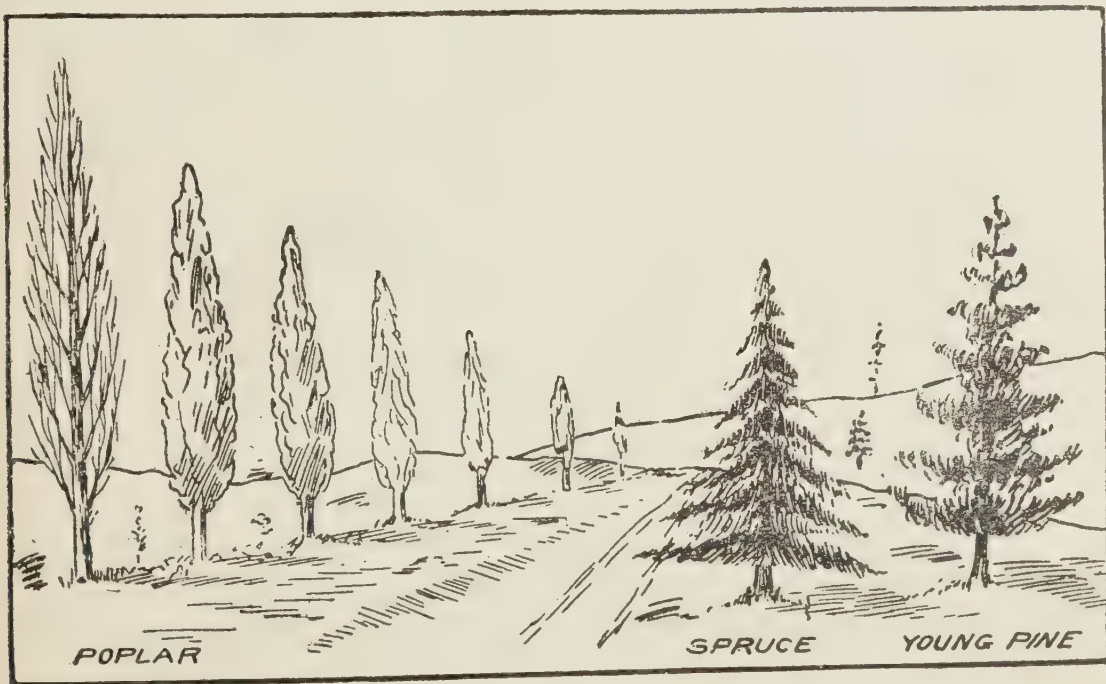


Fig. 179

from it outward and upward. The branches, however, are connected with the stem according to a particular plan, which is different in different kinds of trees.

The trunk of the poplar is vertical and the branches shoot out and upward forming acute angles with the stem.

The spruce and pine have branches almost at right angles to the stem. In the spruce the branches curve slightly down.

The trunk of the willow practically ends at the first branches. Limbs and foliage spring outward and upward in long slender branches.



The stem of the oak rises to about the middle of the top. The branches curve up and are very rugged and crooked.

The maple stem and limbs are more graceful and slender than the oak. The general form is much the same, although it lacks that sturdy appearance peculiar to the oak.

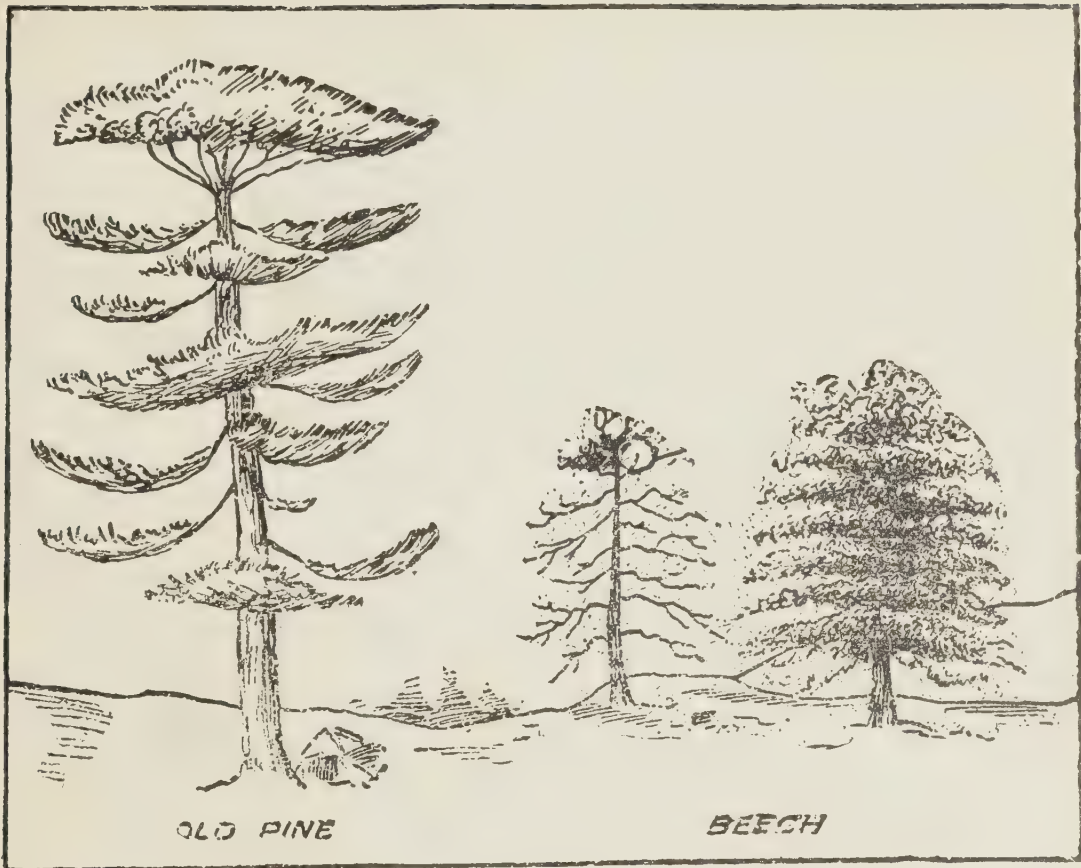


Fig. 181

The stem of the beech is quite straight and reaches nearly to the top of the tree, where it breaks up into branches that slant upward. The other branches are quite long and slender and turn up gently at the ends. The lower branches droop.

An elm tree divides at the first limbs which spread outward and upward, then downward in gentle curves.

The top of the apple is much like a hemisphere. The trunk is short and lost at the first branches.

As a general rule, the outline of the foliage is controlled by the arrangement of the branches. A knowledge of this arrangement will aid in memory drawing.



Fig. 182

The farther away a tree is, the less distinct it appears. Represent such by light lines.

Problems.

1. Show, by a drawing, the general construction of the trunk and branches of a cherry tree.
2. Draw a small house, in front of which is a maple tree.
3. Show an ordinary board fence receding and along which is a row of poplars.
4. Compose a simple scene in which the horizon is suggested, and on the left of the picture a group of elms.
5. Outline a group of three pines.

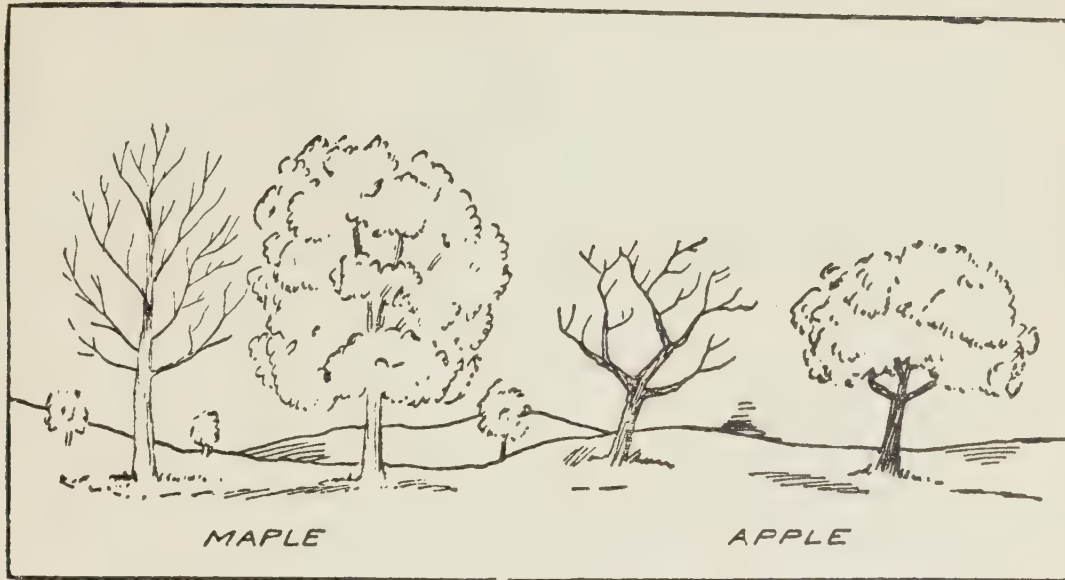


Fig. 183

13. Drawing From the Flat.

It has been argued that the hand develops conjointly with the power to interpret impressions received through the eye. This may be true when the hand and eye have equal opportunities. We are able to draw better with the right hand than with the left, simply because the right hand has had more practice. In fact any organ will develop with practice properly taken. If the desire is to suggest intelligently all that is seen, the hand must be given opportunities of actually doing so. Drawing from the flat—copying the drawings of others—while not affording as good training to the eye as drawing from the object, will give the hand excellent practice, if judiciously conducted. Too much drawing from the flat tends to blunt personal effort. There is a tendency, too, as soon as an object is recognized, to refer it to a type already learned, and, if care is not exercised, the drawings thus made exert an undue influence. Occasional exercise in copying has the advantage of lending profit by others experience. Good copy, too, will present good methods of representation and cultivate a taste for better illustration.

Choose then, only such drawings as are worthy of imitation and make as accurate a copy as possible.

Here, as in drawing from the object, proper proportions of size and relative position of parts must be accurately observed. All work should be done without instruments and all distances judged by the unaided eye. No construction lines should be drawn on the copy, although, in first exercises, it is quite legitimate to use light construction lines in making the outline.

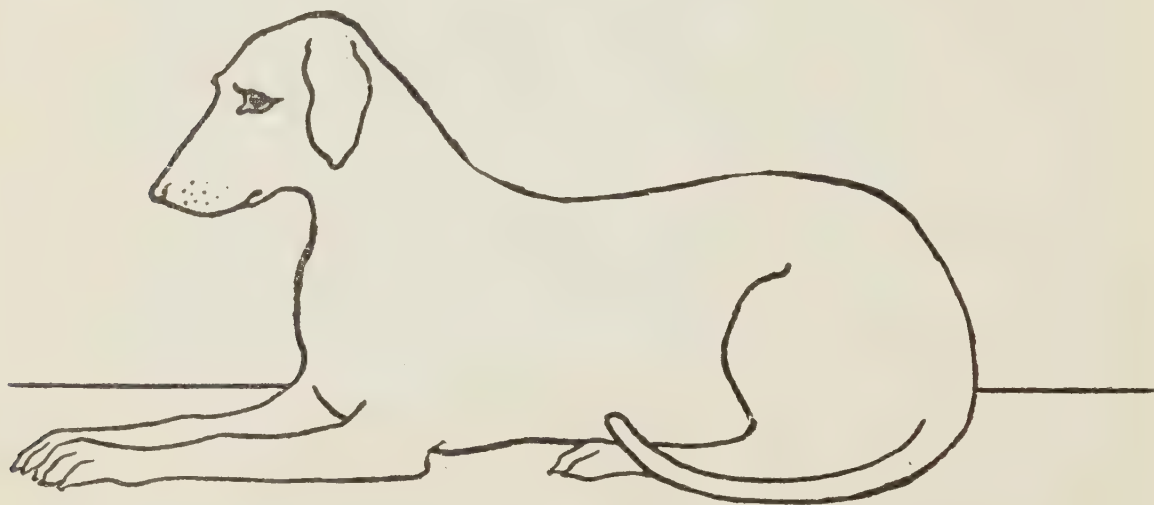


Fig. 184

To make a copy of fig. 184, some such construction lines as are shown in fig. 185 may be used. These will aid in fixing the position of the points marked. Some definite distance, say E to H, should be taken as a unit of measurement and all other distances judged in proportion to it. The more prominent points are indicated by letters.

At first, drawings should be made the same size as the copy. Reducing and enlarging is much more difficult.

A shaded drawing is much more difficult to copy than an outline. Fig. 187 shows the method of making an outline preparatory to adding the shade.

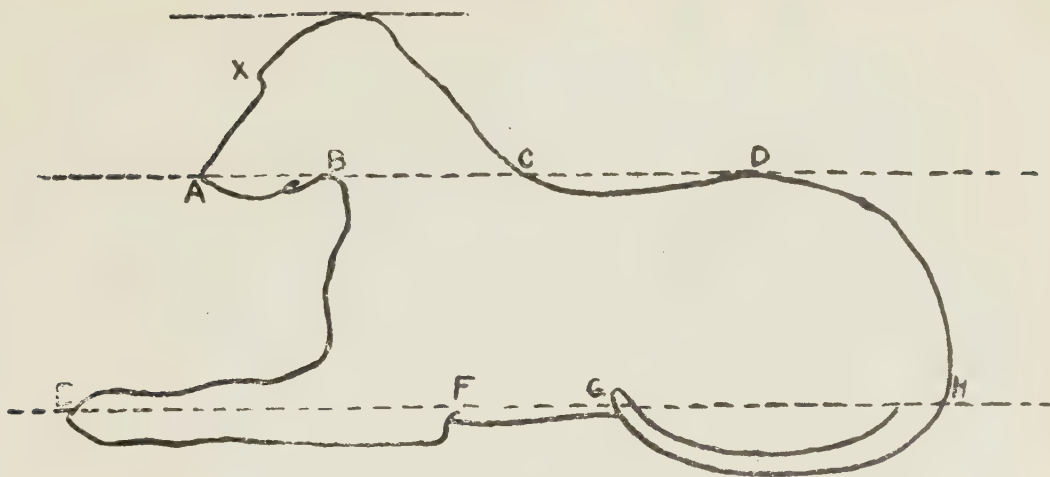


Fig. 185.

Copy fig. 186, enlarging it to 6 in. in width. Examples, in addition to those that follow, are found in many of the sections preceding.

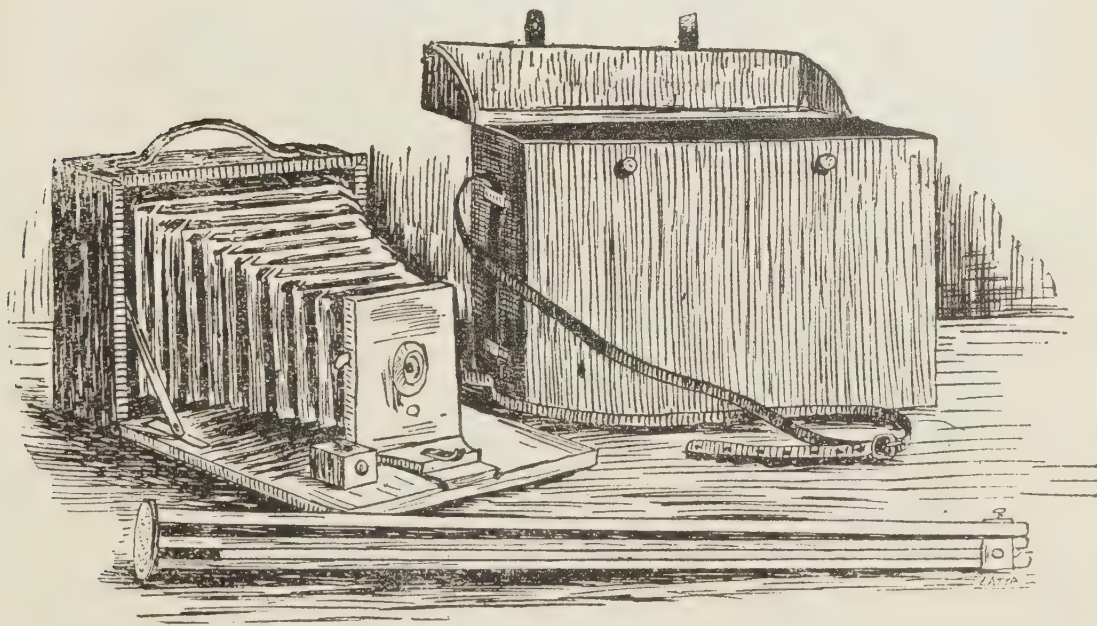


Fig. 186

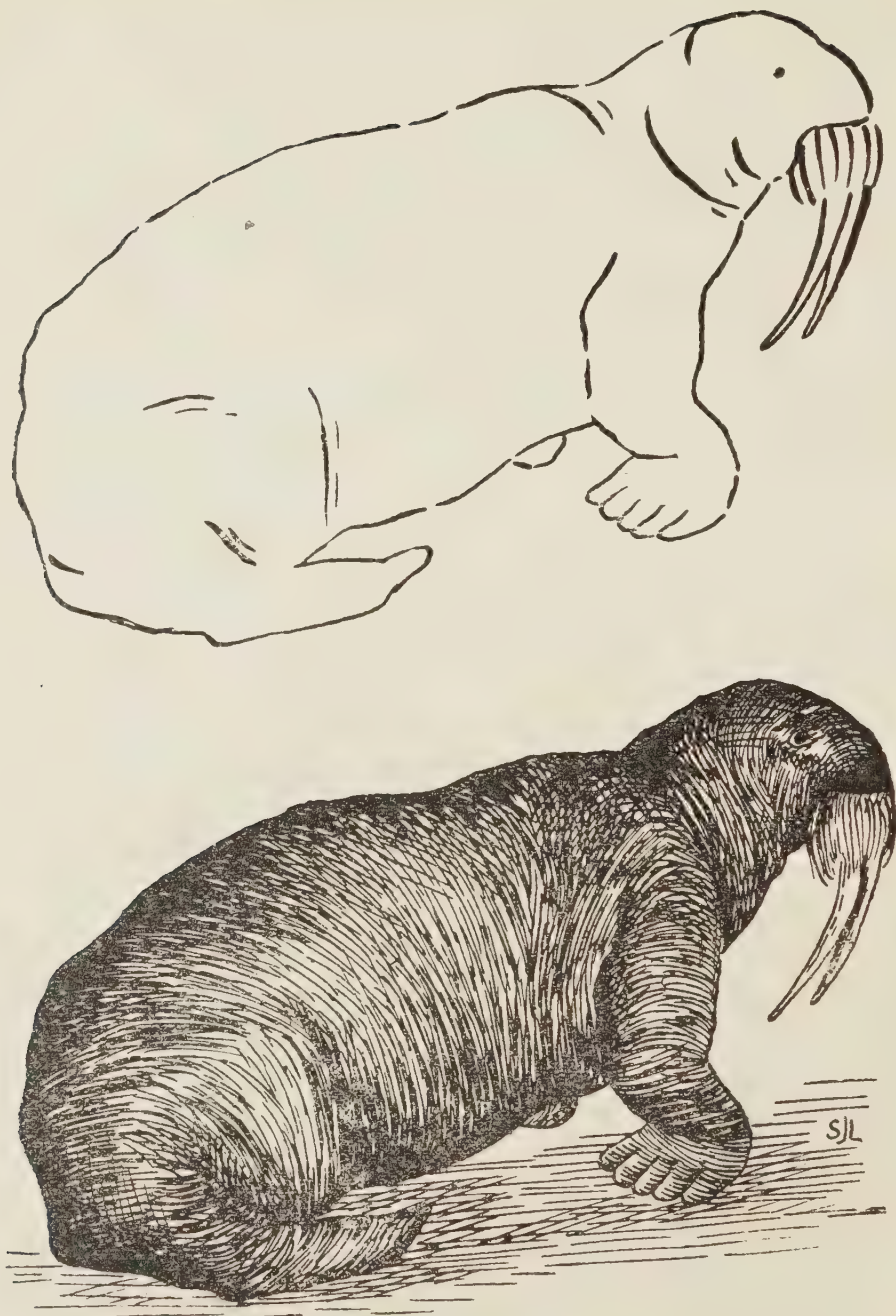


Fig. 187

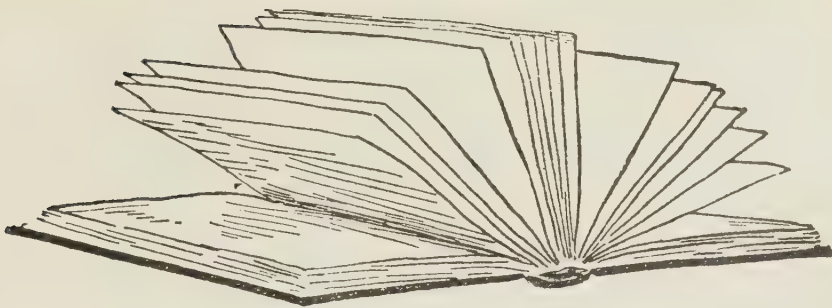


Fig. 188



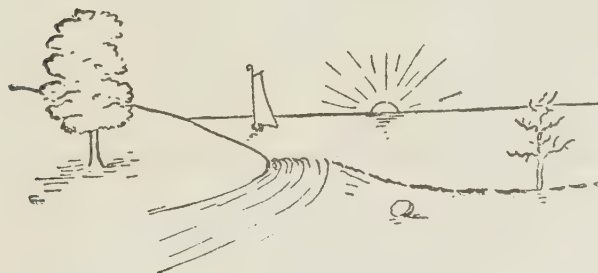
Fig. 189



Fig. 190

PART IV.

APPLIED PERSPECTIVE, GROUPING, SHADE AND SHADOW.



1. The Horizon.

Look out over a large body of water, a lake or the sea, or look down a long level road. The sky seems to slope downward to the earth. On the water where there are no trees or hills the place of meeting appears to be a horizontal line. This *Horizon Line* is always on a level with the eye. Stand at the edge of the water. The sails of a boat, a few rods from the beach, appear above the horizon. See fig. 191. But stand on the bank above the beach where the eye is much higher than before and the scene is changed. The horizon can be seen plainly above the sails, or at least nearer to the top. Other objects that seemed to shut out the horizon before are now below it. See fig. 192. No two persons then see the same horizon line unless their eyes are on the same level.

Notice, too, that the position of an object may be termed *relative*, that is, although the object may remain stationary, its position in relation to the eye and to other objects changes when the position of the spectator is changed. We move to the right or left of an obstacle to see what is behind it; the same result would be obtained were we able to move above or below.

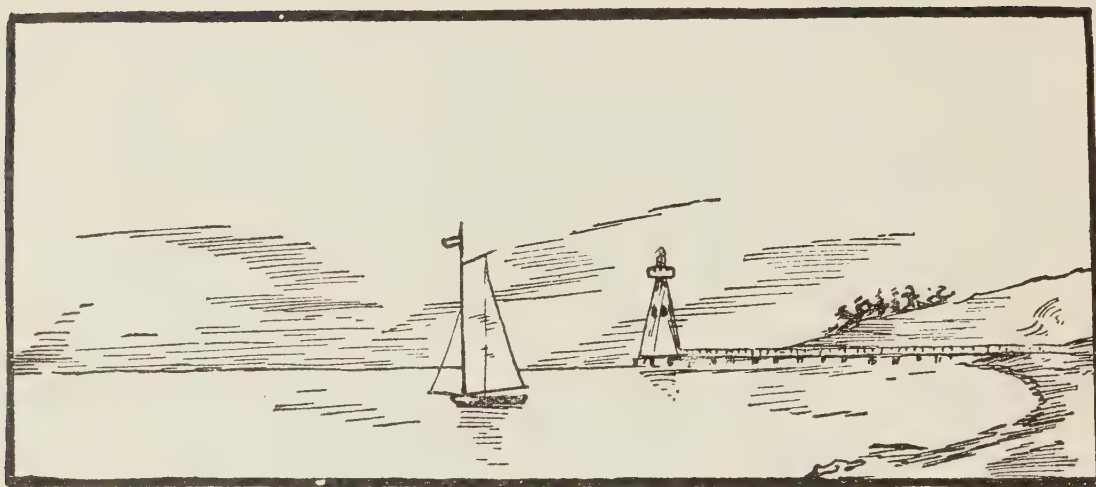


Fig. 191

The horizon is not always visible. It may be shut out from view by other objects, such as trees or buildings. For convenience, however, especially when drawing from memory, it is better to indicate the position of the



Fig. 192

horizon line. It will serve as a guide in representing objects below or above the level of the eye. See fig. 193.

In fixing the position of the horizon line it is very necessary to consider the conditions under which an object is likely to be seen. A table, for ex-

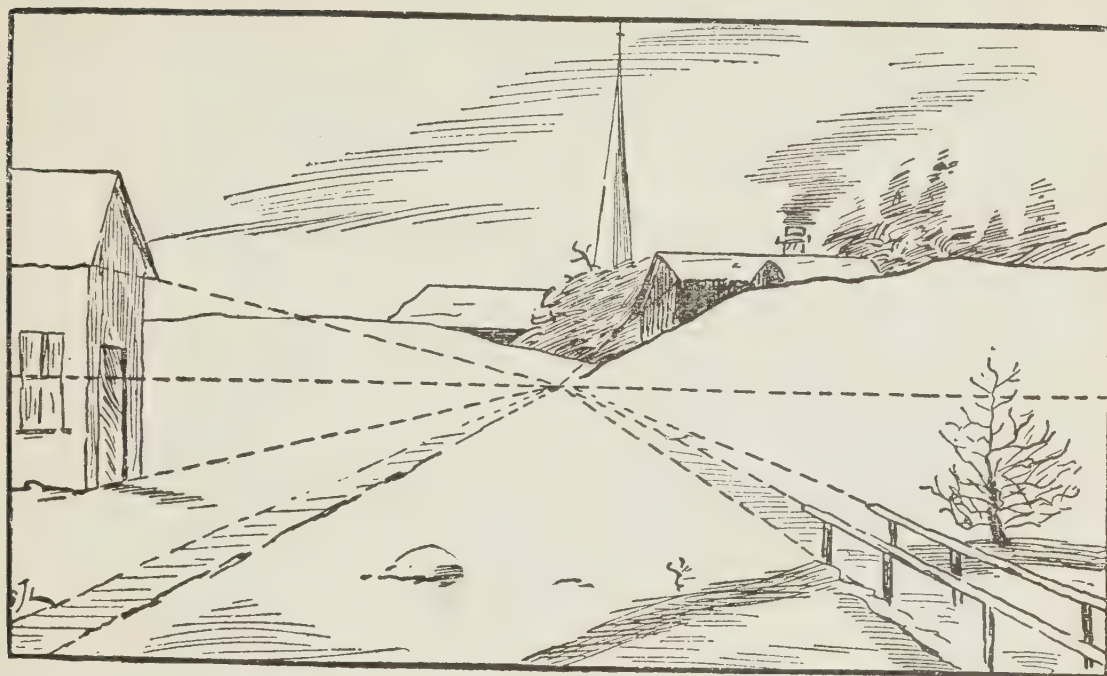


Fig. 193

ample, is about half the height of an ordinary person. It is generally seen when the spectator is on the same ground. If standing, the height of the horizon line from the bottom of the table should be about double the height of the table. Compare the height of the object with the height of the eye above its lowest part and fix the position of the horizon line accordingly.

2. Parallel Perspective.

The Cube.

A pane of glass about 16 inches wide and 20 inches long, two small cubes about 6 inches a side, a table and a pointed piece of hard soap are required for the following experiment :

Place the glass in a vertical position on the table. Place one of the cubes near the left and on the farther side of the glass, so that one of the faces is in contact. Place the other near the right and a few inches away, but having one face parallel to the glass. Sit or stand directly in front, on

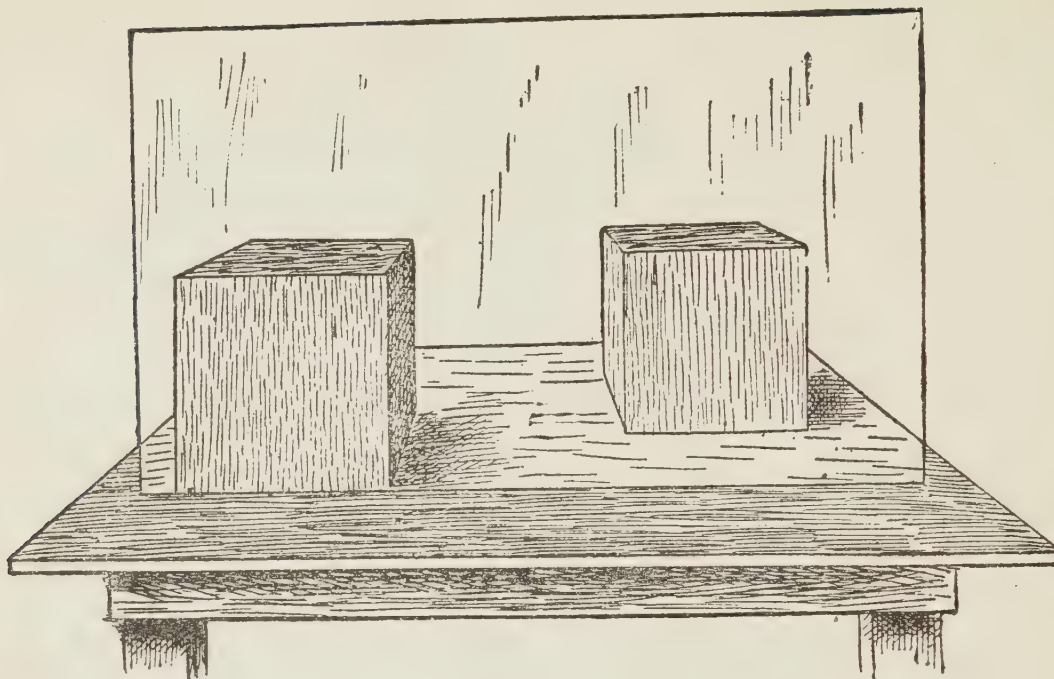


Fig. 194

that side opposite to the cubes, so that the eye is slightly below the top, but above the cubes. The appearance is shown in fig. 194.

Indicate on the glass, by making dots with the soap, the position of each visible corner of the cubes. While doing this, it is best to keep one eye closed. Be careful to keep the eye always in one position.

Remove the cubes and join the points by straight lines to represent the edges. The drawings thus made are perspective outlines of the cubes in this position.

Perspective Drawing signifies *looking through*, which suggests something through which to look. This something is an imaginary, transparent plane somewhere between the eye and the object. It is represented in our experiment by the pane of glass which we shall call the *picture plane*. It is always perpendicular to the direction in which we are looking. The drawing paper, as we have before intimated, represents this picture plane. Drawings should be made on paper as if the object were seen

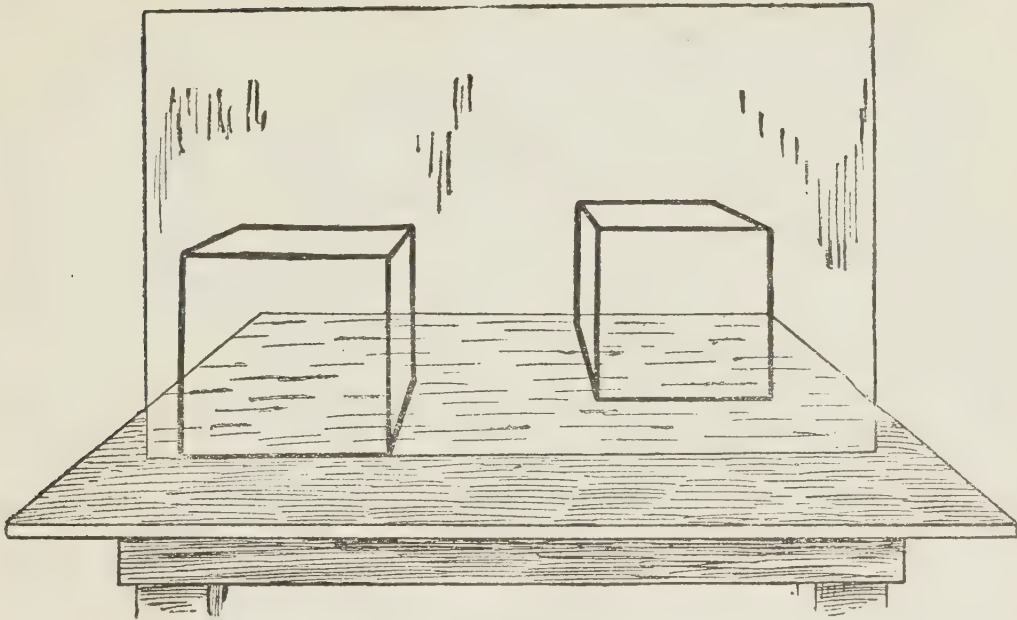


Fig. 195

through and traced upon it in the same manner as upon the glass. To actually do this with an opaque piece of paper is impossible. Important principles, however, may be deduced from this and other experiments to aid in representing on paper what we see.

An examination of the drawings, (Fig. 195), shows that the outline figures representing the faces which were parallel to the picture plane are perfect squares. So are those faces of the cubes. The sides of the squares are vertical and horizontal. So are those edges of the cubes. It is easily seen too, that no matter how the cube is turned, those faces which are kept parallel to the picture plane, are represented by perfect squares the sides of which will be oblique if the edges of the cube are oblique or vertical and horizontal if the edges are so.

Notice too, that the edges which were vertical are represented by vertical lines and that those edges which were horizontal and parallel to the picture plane are represented by horizontal lines.

First Principle: Surfaces or edges which are parallel to the picture plane are represented as they actually are, that is, they are not foreshortened.

By reference to the same figure it will be seen that the two faces which were parallel to the picture plane, although represented by perfect squares, are not represented by squares of the same size. These two faces of the cubes are of the same size, but the farther face is represented by the smaller square. All vertical edges, although represented by vertical lines, are represented by lines of different lengths. The edges of the cubes are all of the same length, but the farther edge is represented by the shorter line. Read also *Effect of Distance*.

Second Principle: The farther an object is removed from the picture plane the smaller will be the representation of it.

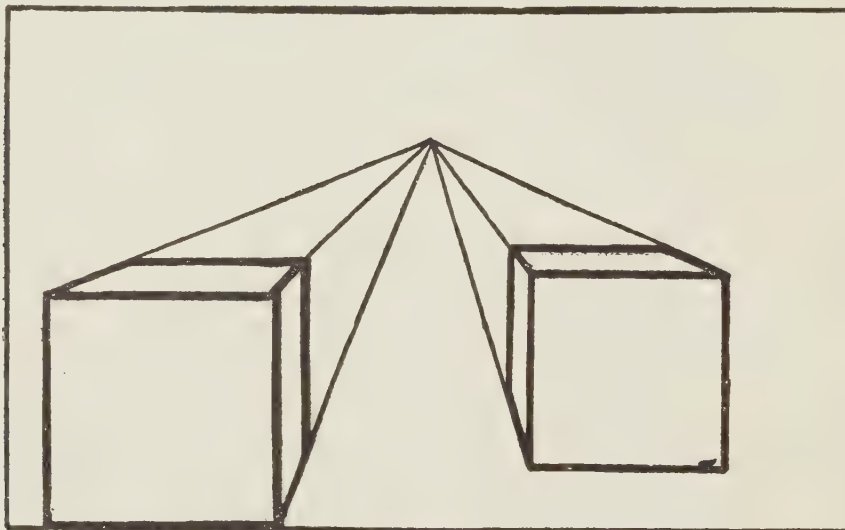


Fig. 196

Receding edges are those which if produced towards the picture plane will cross it. Produce the lines representing receding edges until they meet. If the experiment has been performed accurately it will be found that these lines will converge to meet at a point (*a vanishing point*), and that this point is on a level with and directly in front of the position of the eye when viewing the objects. It is the *Centre of Vision*. See fig. 196.

Third Principle: All receding edges which are perpendicular to the picture plane are represented by lines which converge to meet at the centre of vision.

These three principles, if understood, will be a great help, especially in memory drawing. Care, however, should be exercised to guard against being entirely guided by them. They will not solve all difficulties.

The centre of vision is a fixed point upon which the eye is directed. All other points are described as relative to it. The horizon passes through the centre of vision. It is represented in the drawing by a horizontal line called the *horizon line*. The position of the person viewing the object or landscape, as the case may be, is such that the eye is directly opposite and on a level with the centre of vision. He or she is represented by a vertical line crossing the horizon line at the centre of vision. This line is called *the Spectator*. See fig. 197.

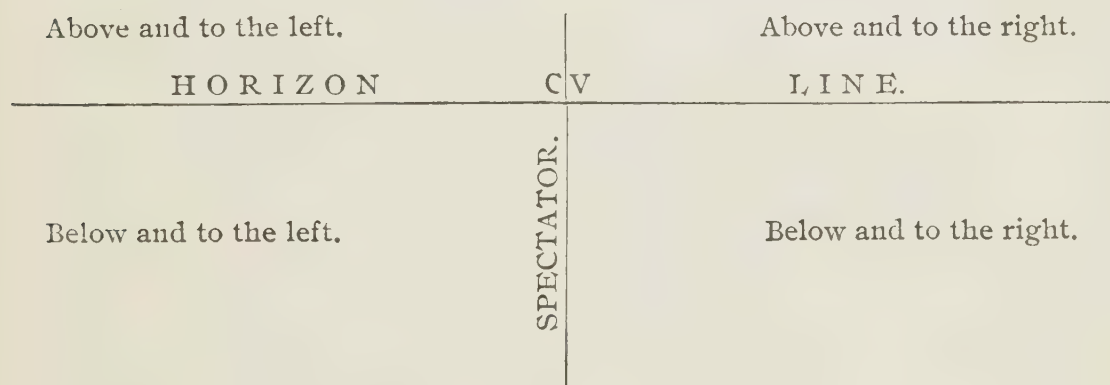


Fig. 197

The position of an object is described in reference to these imaginary lines and points. Fig. 198 shows the positions of nine cubical blocks, each in a different position, and all having one face parallel to the picture plane.

In these experiments the picture plane is supposed to be in contact with the object or group to be represented. The *ground* therefore is a horizontal line touching the bottom of the nearest object.

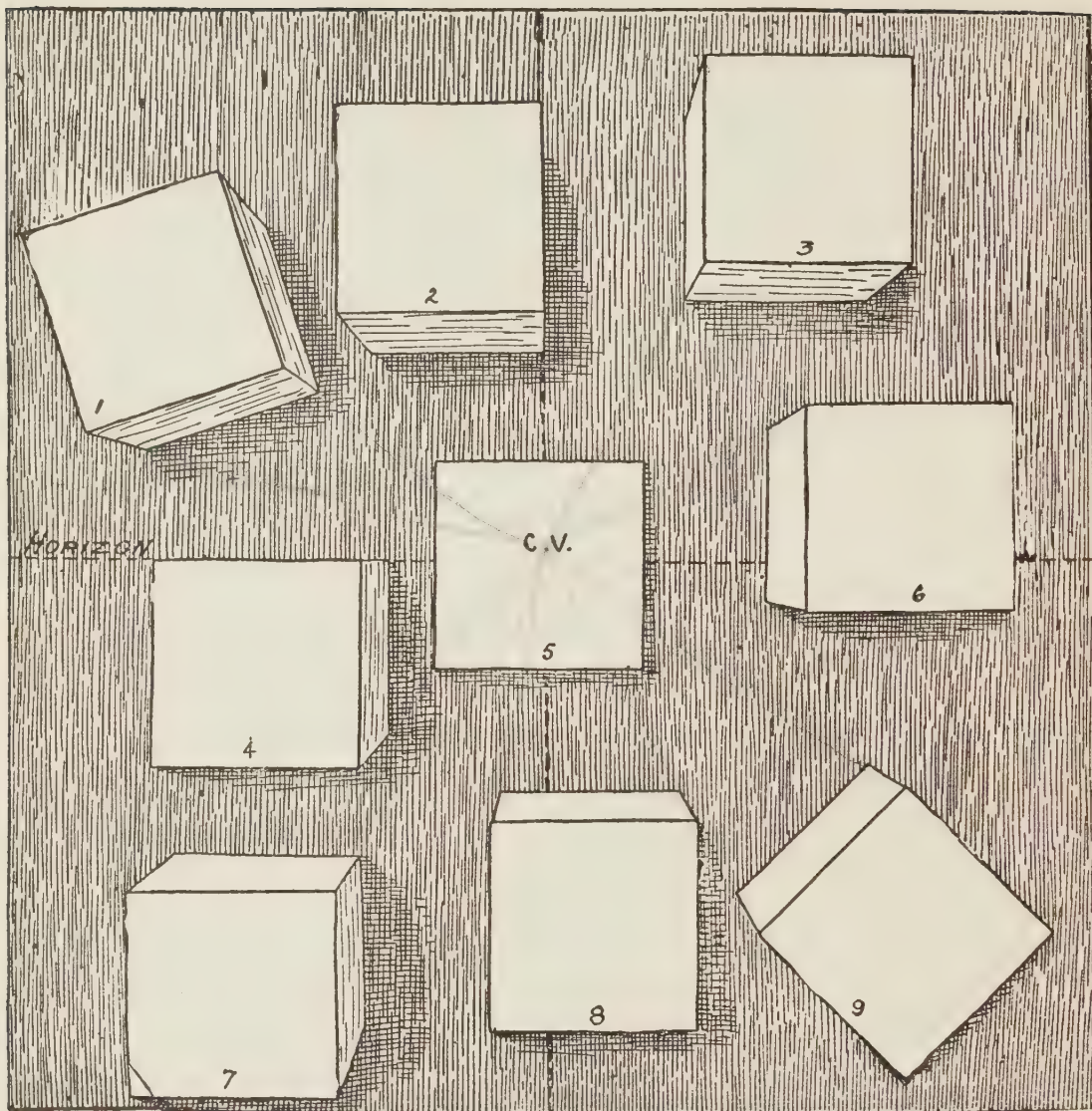


Fig. 198

Each position may be described as follows:—

1. To the left and above; sides of the parallel face (parallel to the picture plane) oblique.
2. To the left and above; sides of the parallel face vertical; right side in line with the spectator.

3. To the right and above ; sides of parallel face vertical.
4. To the left and below ; sides of the parallel face vertical ; top in line with the level of the eye.
5. Directly in front ; sides of the parallel face vertical.
6. To the right ; top above and bottom below the level of the eye ; sides of the parallel face vertical.
7. To the left and below ; sides of the parallel face vertical.
8. In front, slightly to the right and below ; sides of the parallel face vertical.
9. To the right and below ; sides of the parallel face oblique.

Notice, in all these drawings, that there are but two classes of lines, representing two classes of edges :—

1. Edges which are parallel to the picture plane, represented by lines drawn in actually the same position as the edges they represent.
2. Receding edges, represented by lines which converge to meet in the centre of vision.

Place an ordinary chalk box directly in front but below the level of the eye, so that the nearest face is parallel to the picture plane ; edges vertical and horizontal.

The nearest face is parallel to the picture plane and therefore not foreshortened. Represent this face by a rectangle, the sides of which are in proportion to the edges of the box. The size of the rectangle will determine the size of the finished figure.

There are two receding parts visible. Represent them by lines converging to meet at the centre of vision.

Compare the height of the box with the distance that the eye is above the ground (that upon which the box rests). The height of the box, in this case, we suppose to be about one-third of the height of the eye from the ground. Sketch the horizon line, so that the distance between the bottom of the rectangle and the horizon line is about three times the height of the rectangle.

Choose a point, in the horizon line directly above the rectangle, to represent the centre of vision.

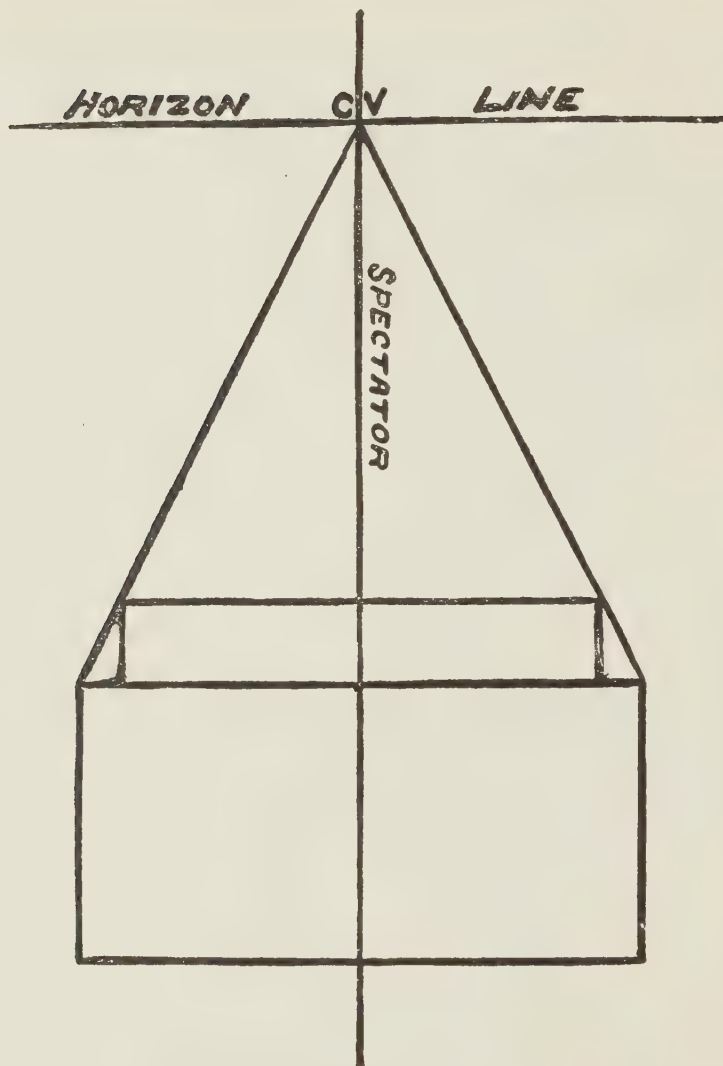


Fig. 199

Compare the height of the farther visible edge with the height of the box and sketch a horizontal line in a corresponding position to represent the farther edge. This line is between the converging lines already drawn. The inside visible corners are vertical. Represent the visible parts by vertical lines. These vertical lines are between the horizontal lines representing the tops of the sides.

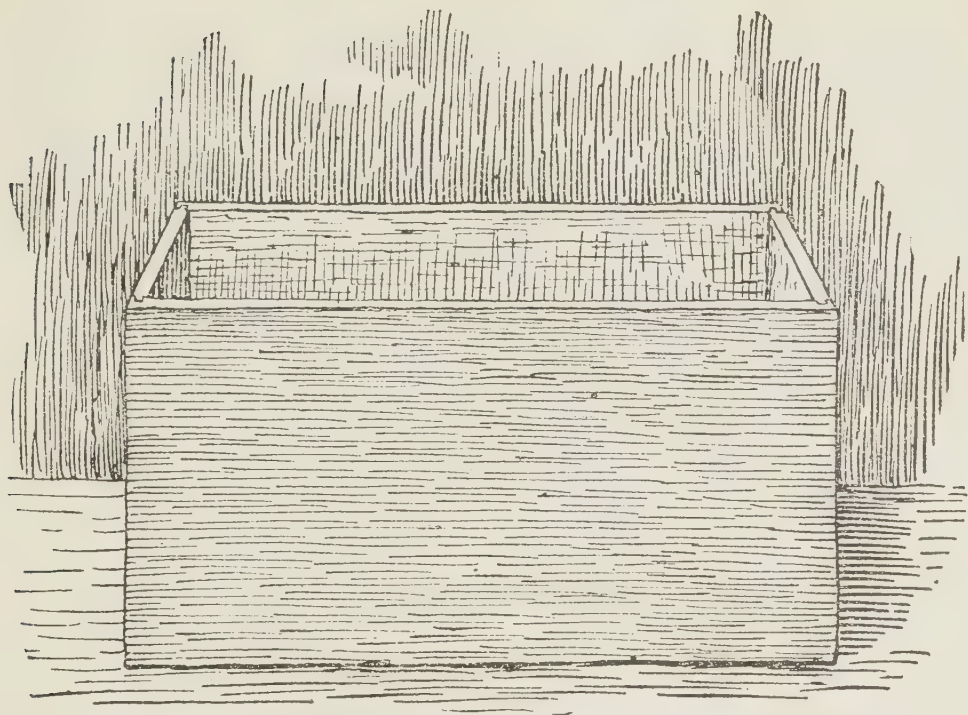


Fig. 200

Line in and represent shade and shadow. See fig. 200.

It is not advisable in a first attempt to represent the thickness of material. This may be attempted after the principles have been fairly well understood.

Fig. 201 shows the construction lines which may be used in outlining a chalk box from memory. The outline is strengthened so that the lines required may be clearly seen. The position may be described as below the eye and to the left.

Fig. 202 is a shaded drawing of the same box, built upon an outline made in the same manner as fig. 201.

An edge may be parallel to the picture plane and still be vertical, horizontal or oblique. Since the picture plane is supposed to be vertical, all vertical edges are parallel to it, but *all* horizontal or oblique lines are not parallel to the picture plane.

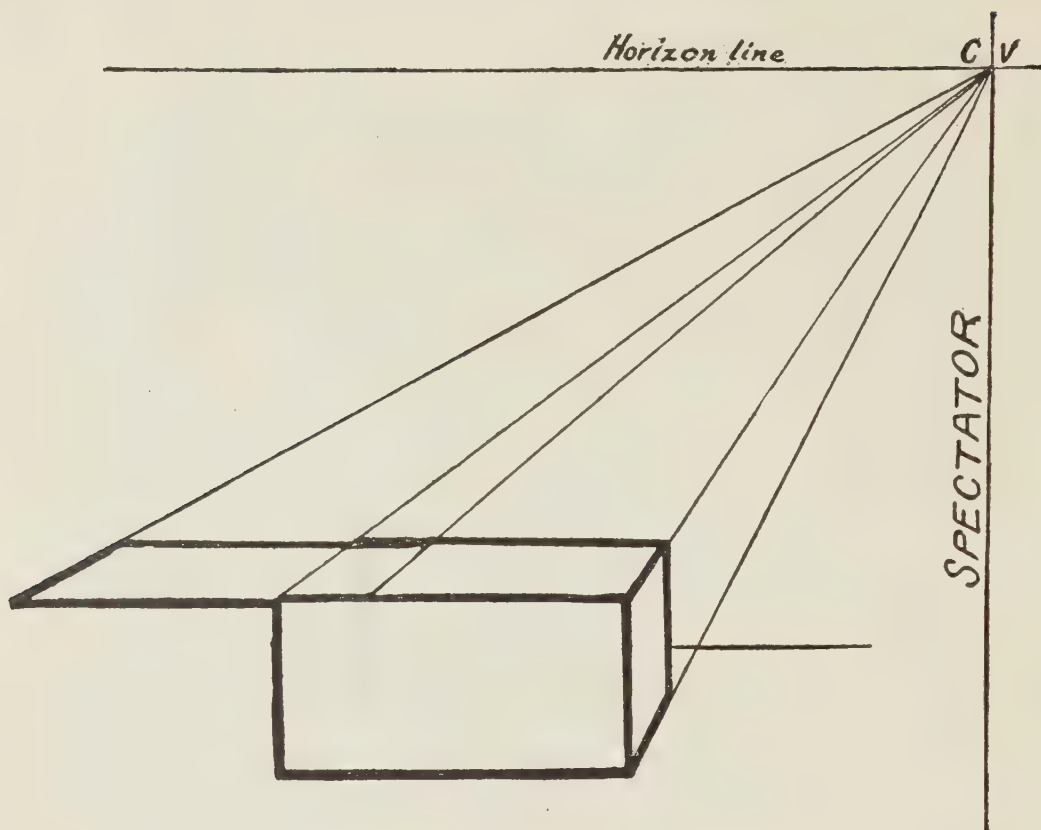


Fig. 201

Fig. 203 requires no explanation. The principles before stated are applied here as one face of each cubical block is parallel to the picture plane.

Fig. 204 is a finished drawing of the same group.

Although many objects are cubical in form, they do not possess the hard, exact outline of a cube. Care should be taken, in such cases, to represent such points of detail that will give the object a natural appearance.

The square tablet is an excellent model to use in the first exercises of this section. Since it practically represents one surface of a cube, it may be used to advantage before drawing from the cube as a whole. It is thought unnecessary to introduce it because of its being used in the section on *Foreshortening*.

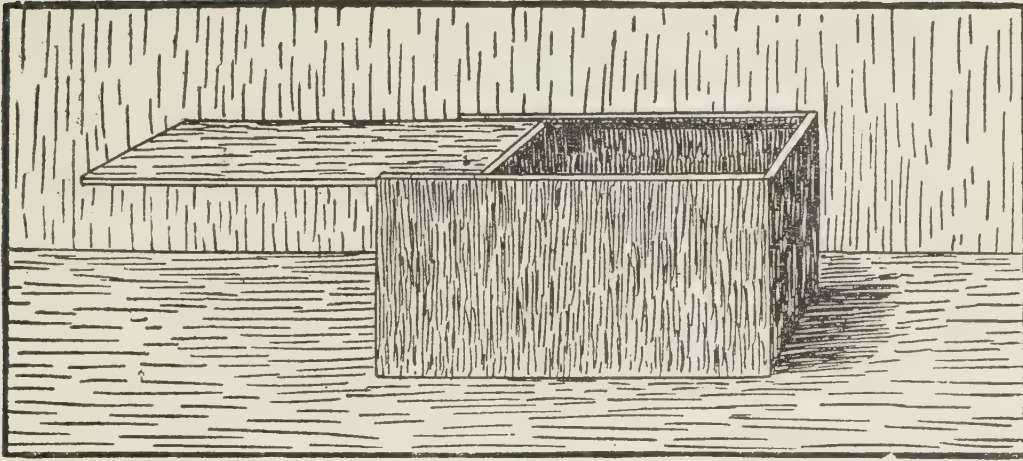


Fig. 202

While this is necessary, the outline sketch upon which the finished drawing is based, should be carefully and accurately made. (Fig. 211.) See also figure of the old well in *Shade and Shadow*.

Problems.

1. Draw the following cubical objects as they appear when one face is parallel to the picture plane :—

- | | | |
|-------------------|-----------------|---------------------|
| 1. A trunk. | 5. A wagon box. | 9. A basket. |
| 2. A biscuit box. | 6. A cross. | 10. A cigar box. |
| 3. A pencil box. | 7. A book. | 11. An ink bottle. |
| 4. A brick. | 8. A valise. | 12. A pile of wood. |

2. Draw the following objects as they appear when one edge recedes at right angles to the picture plane :—

- | | | |
|-----------------|----------------------|---------------------|
| 1. An envelope. | 3. A sheet of paper. | 5. A pane of glass. |
| 2. A slate. | 4. A card. | 6. A shingle. |

Fig. 205 may be submitted as an answer to No. 2 of problem 2.

3. Draw three cubical blocks, one to the left, one to the right, one directly in front ; all below the eye level.

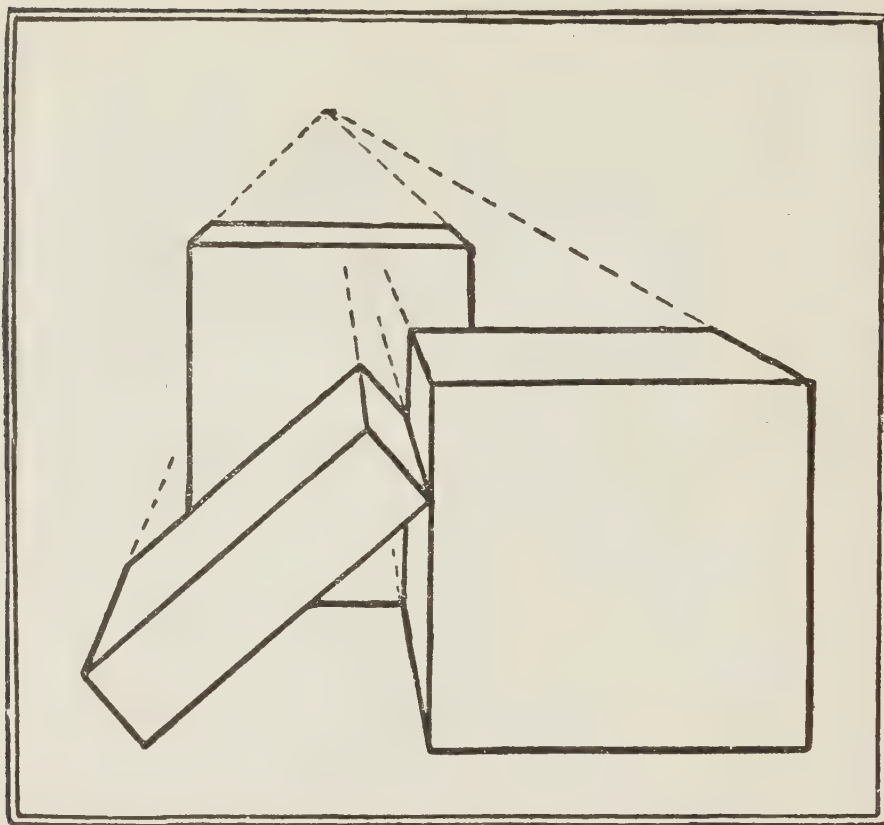


Fig. 203

4. Draw a cubical block, one face parallel to the picture plane, to the right and below the eye. Show a square opening, receding through the centre of the block. (Fig. 206.)

In fig. 206 first sketch the parallel face and outline the square opening. The inside edges of this opening recede at right angles to the picture plane, and are represented by lines converging to meet at the centre of vision, in the same manner as the receding edges of the cube.

Sketch all receding lines.

Measure the distance the vertical edge E F appears to the left of A B. Sketch E F (vertical) and F G (horizontal). Sketch the invisible edges E N,

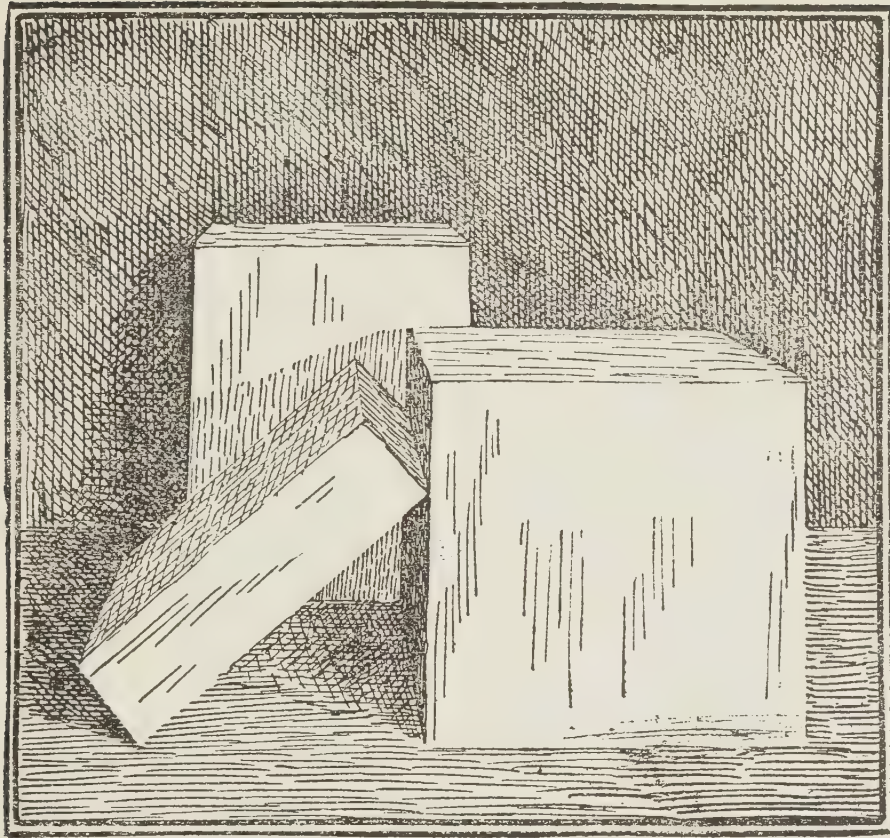


Fig. 204

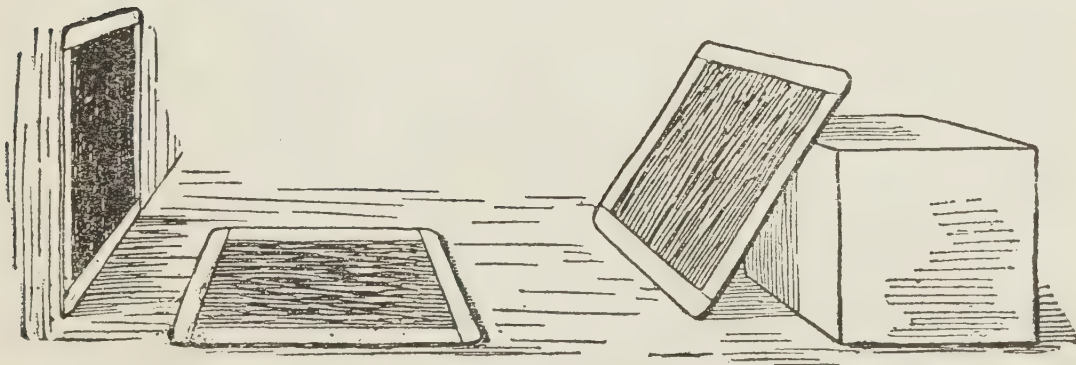


Fig. 205

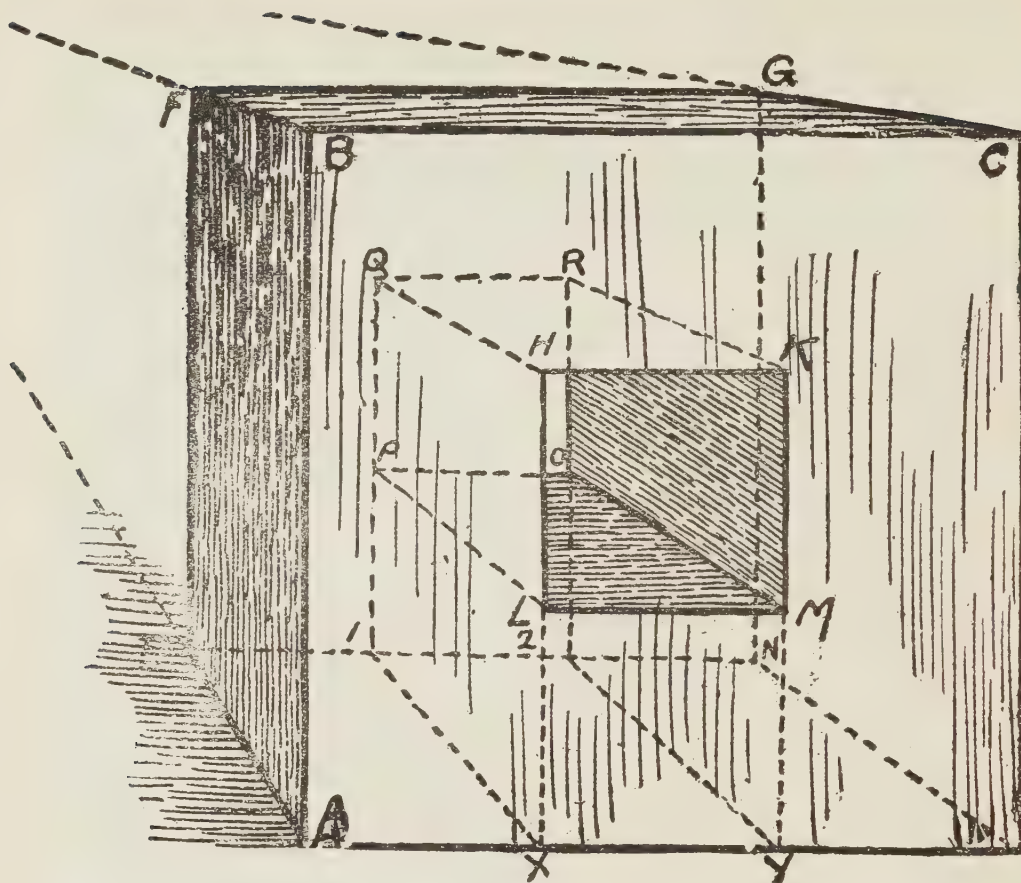


Fig. 206

D N and G N. These of course will be horizontal, receding and vertical. By producing the vertical edges of the opening H L M K downward to X and Y on the lower edge and sketching receding lines from these points to 1 and 2, two points are found directly below the opening in the farther face F E N G. The edges of this opening are easily found by sketching vertical and horizontal lines between the converging lines as P Q, R O, P O and Q R, outlining the opening Q R P O. Line in all visible edges.

5. Draw a cubical block, showing a part cut away in such a manner that one of the faces thus formed recedes at right angles to the picture plane. (Fig. 207.)

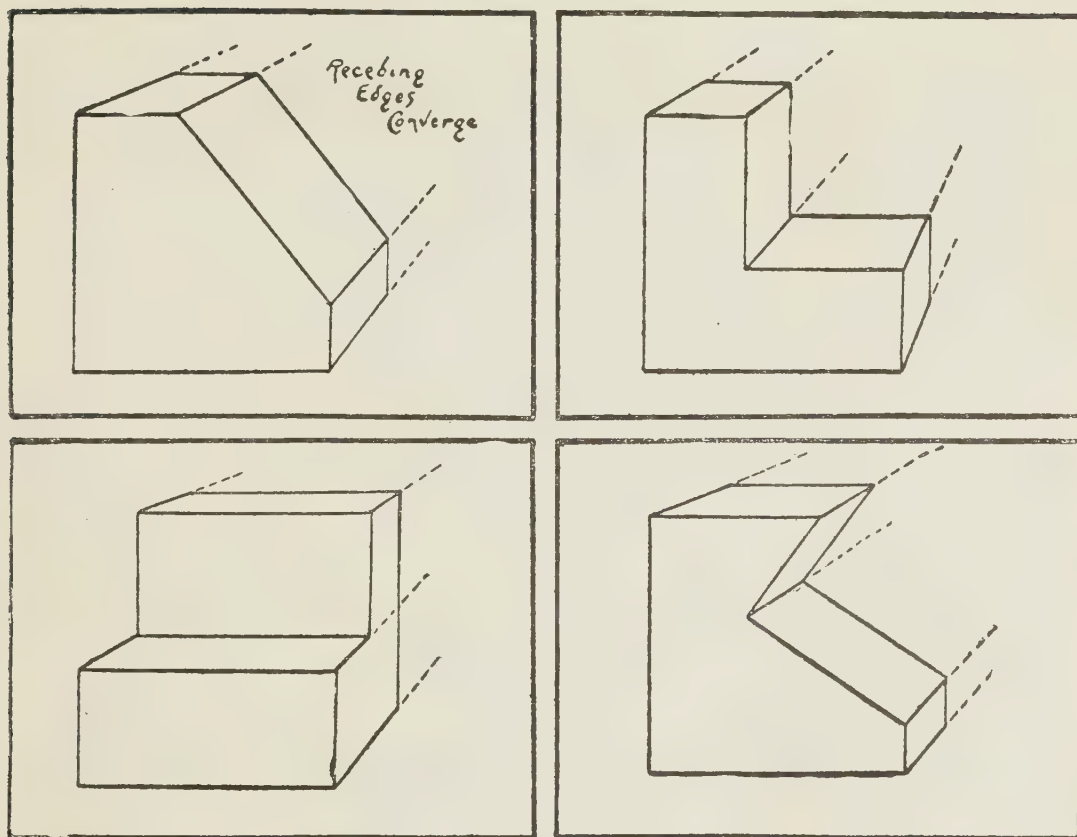


Fig. 207

There will be no difficulty with problem 5 if the foreshortened faces are carefully measured with the pencil and compared with some part already drawn and taken as the standard. If the drawings are made from memory the appearance desired is the only guide.

6. Draw a rectangular tablet standing upon a cubical block, one face of each being parallel to the picture plane.

7. Draw in outline a cubical block ; one edge resting upon the ground and the lower face upon another cubical block ; one face of each block parallel to the picture plane.

In many of the problems in this section the object may be represented in different positions and still fulfil the conditions stated.

8. Draw a book-shelf ; above the eye level. Show the thicknesss of the material.

9. Make an outline drawing of an ordinary kitchen table ; directly in front ; side parallel to the picture plane ; below the eye level.

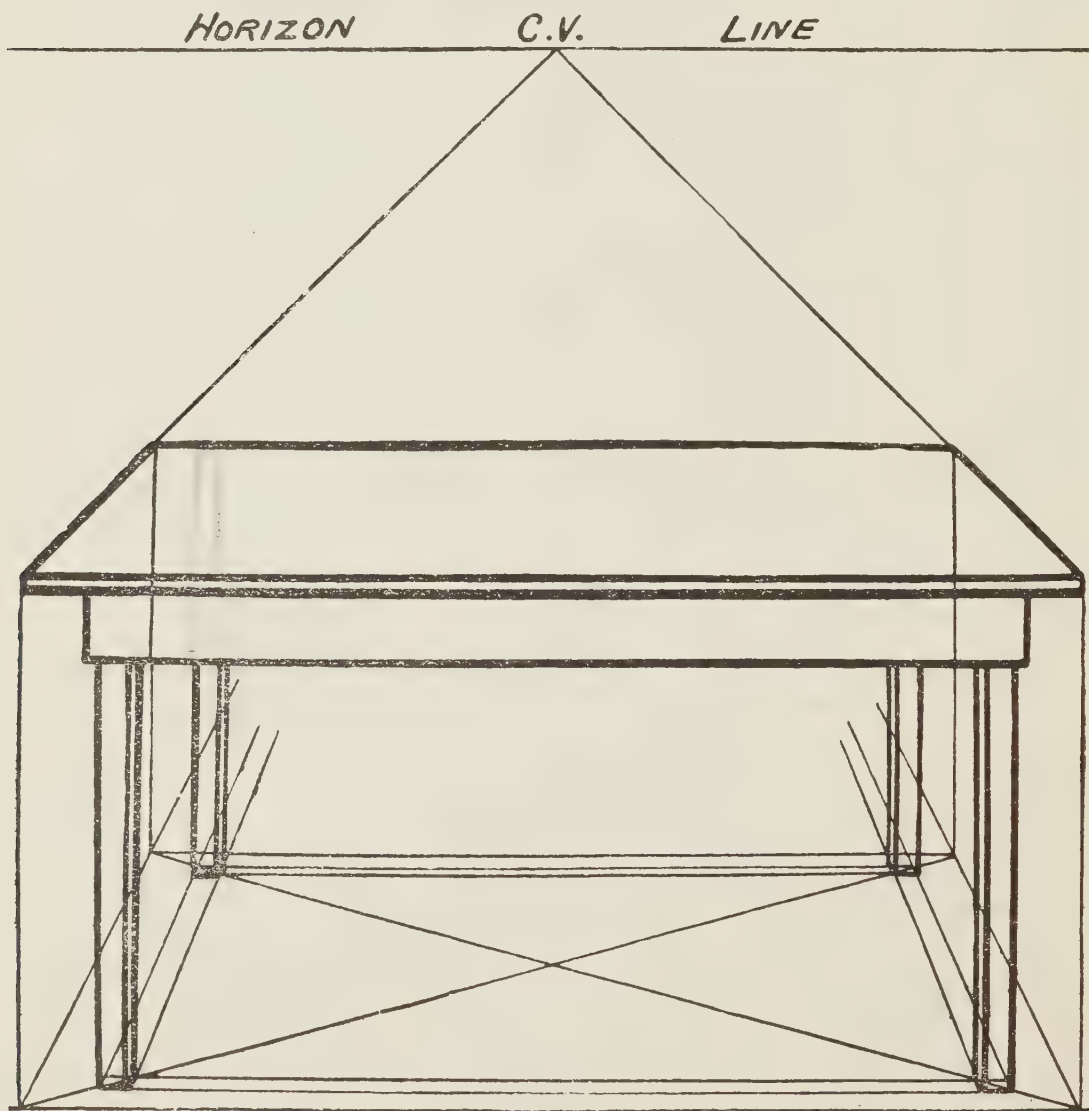


Fig. 208

Fig. 208 shows the method of outlining a table in this position.

10. Draw a rectangular board in the centre of which stands a vertical rod ; below the eye ; directly in front ; edge parallel to the picture plane.

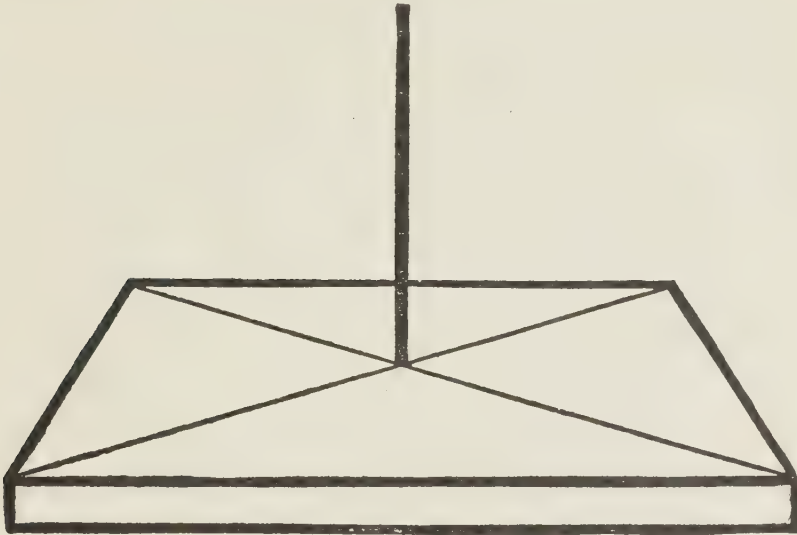


Fig. 209

To find the position of the bottom of the vertical rod in problem 7, sketch the diagonals of the foreshortened face. The rod will stand on the point of intersection of the diagonals. (Fig. 209.)

The Square Pyramid.

11. Draw a square pyramid ; one edge of the base horizontal and parallel to the picture plane.

Sketch the nearest edge of the base (AB). Those edges of the base that recede at right angles to the picture plane are represented by lines converging to meet in C.V. Measure the distance the point C appears above B. Sketch CE. Sketch the diagonals of the base. The vertex D is directly above the point of intersection of the diagonals. Sketch a vertical line and indicate upon it the height of the pyramid. Join the point D with the corners of the base. Line in the visible edges. (Fig. 210.)

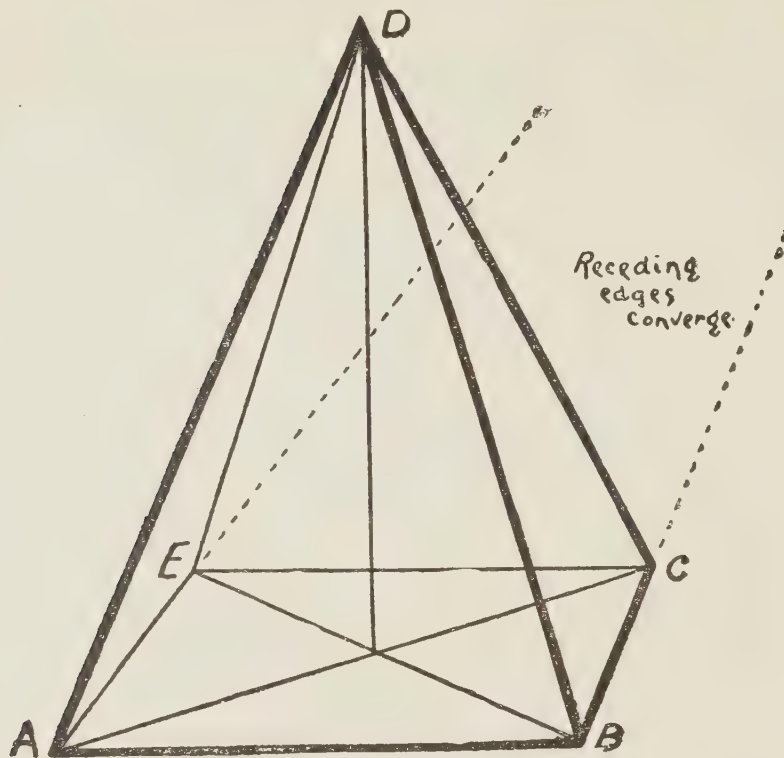


Fig. 210

12. Draw the outline of a square pyramid ; base, below the eye level ; vertex, above ; directly in front ; one edge parallel to the picture plane.

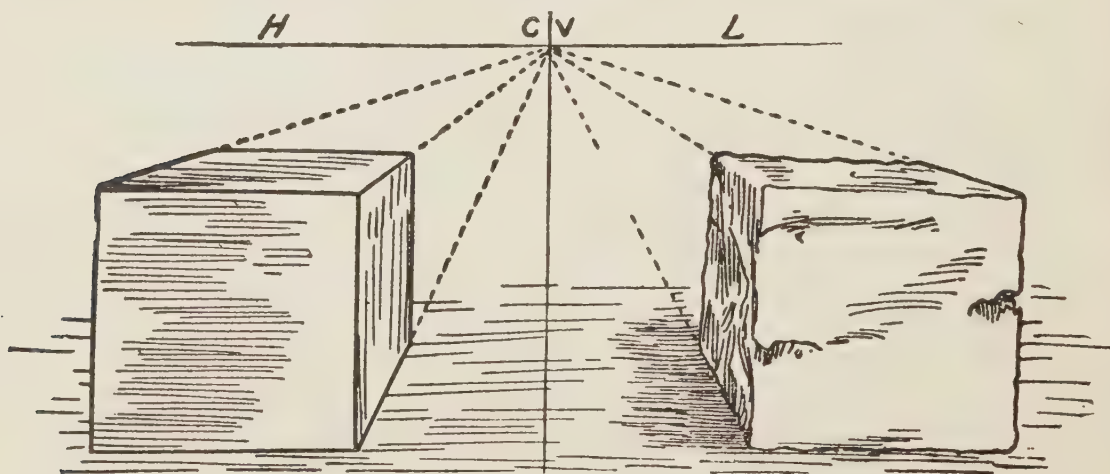


Fig. 211

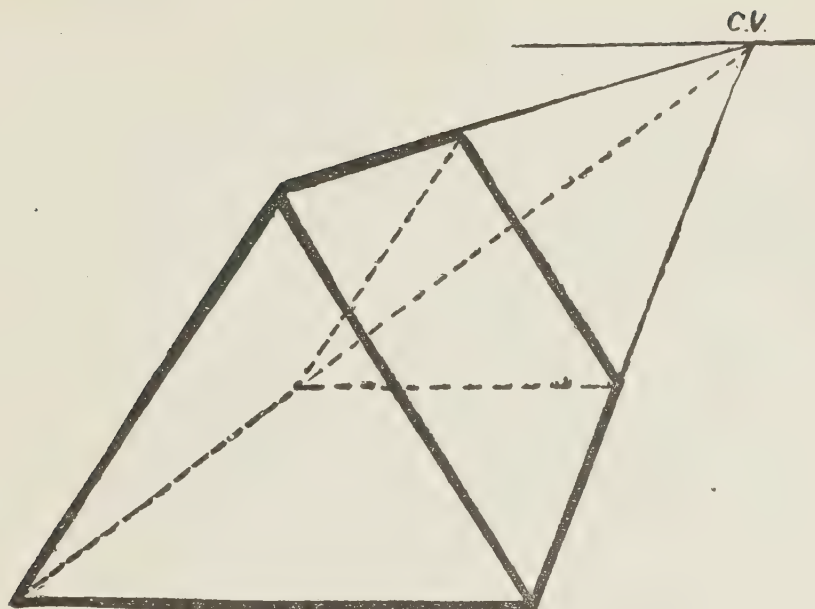


Fig. 212

The Triangular Prism.

13. Draw in outline, a triangular prism ; triangular face parallel to the picture plane. (Fig. 212.)

Such objects as a tent, the top part of a house and a trough resemble the triangular prism in form. The method of construction is clearly shown in fig. 213.

14. Draw a house ; lower part cubical ; upper part like a triangular prism ; one face parallel to the picture plane.

15. Draw a plank balanced on a cubical block ; one face of each parallel to picture plane.

Care should be taken to place the vanishing point in such a position that the outline is not distorted. Such outlines as fig. 212 are really part of a whole picture as the object when viewed by the spectator is naturally in front. Fig. 212 would form part of a group of objects in such a position as fig. 204. The measuring of distance into the picture—from the picture plane—is not treated here as it properly belongs to Linear Perspective. Be guided in this matter by instructions given in *Foreshortening*.

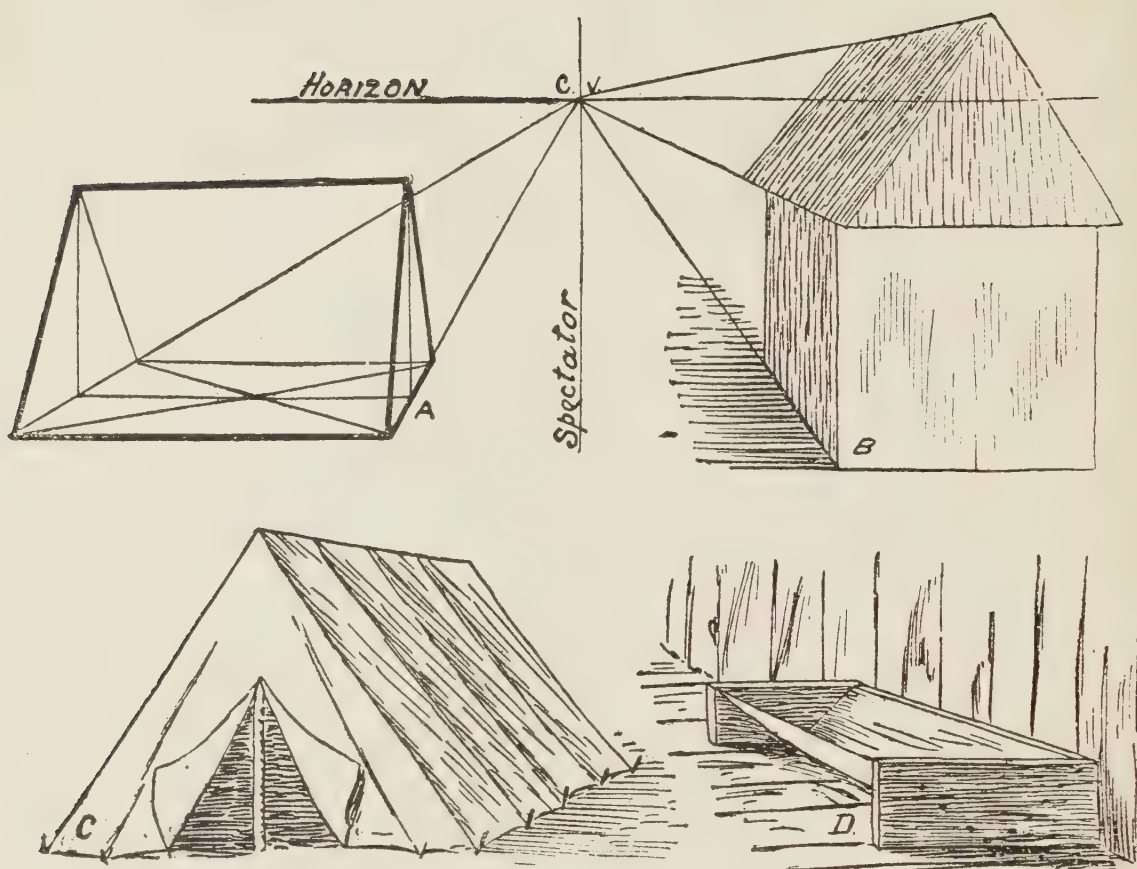


Fig. 213

3. Angular Perspective.

Angular perspective is the representation of an object or group of objects the edges of which are neither parallel nor perpendicular to the picture plane.

In the accompanying illustration (1) is represented in *parallel* perspective and (2) in *angular*.

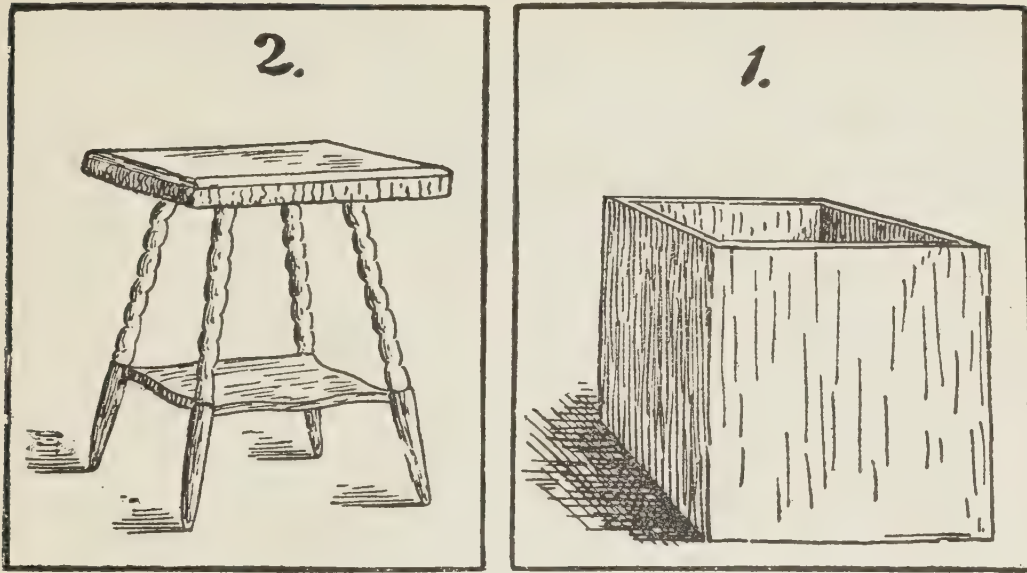


Fig. 214

In addition to experiments similar to those outlined under *Parallel Perspective* carefully perform the following:—

Place a number of sticks, about a foot in length, each in a vertical position on the table in front. Notice that although your position may be changed to the right or left they always appear to be vertical. To be fully



Fig. 215

convinced that this is true, tie a weight to a piece of string and hold this plumb line in line with the eye and each stick. Change your position and repeat the experiment.

First Principle: Vertical edges are represented by vertical lines.

Place a piece of string, about three feet long, under the cover of a book so that about equal portions are on each side. Close one eye, pull the



Fig. 216

string tight and slowly raise the hands until the string is in such a position that the two sections are in direct lines with the eye and two edges of the book. Change the position of the book and repeat the experiment. The book and string will appear as shown in fig. 216.

Second Principle: All parallel receding edges are represented by lines which converge to meet at the same point.

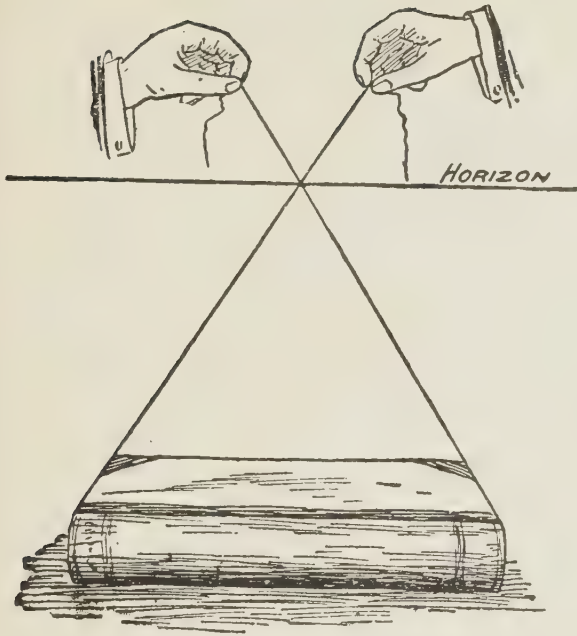


Fig. 217

Repeat the experiment allowing the book to lie flat on a level table and the string to intersect at a point vertically above the edge to which it is attached. The point of intersection is on a level with the eye—in the horizon. (Fig. 217.)

Place something under the book so that the farther edge is raised. Proceed as before. The point of intersection now is above the horizon. (Fig. 218.)

Change the support so that the edges recede downward. Where is the point of intersection now? (Fig. 218.)

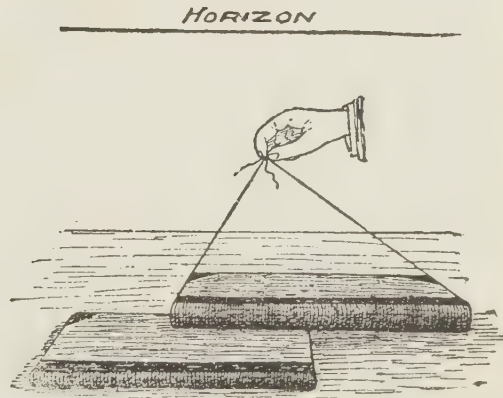
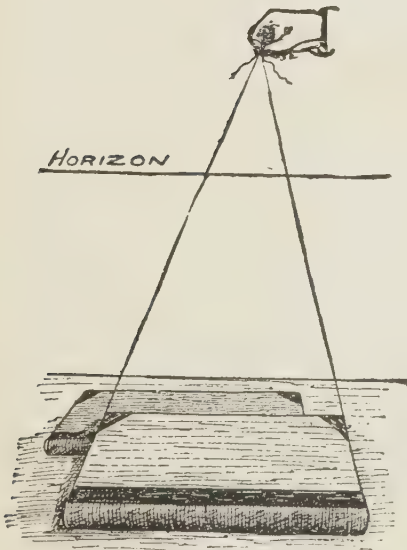


Fig. 218

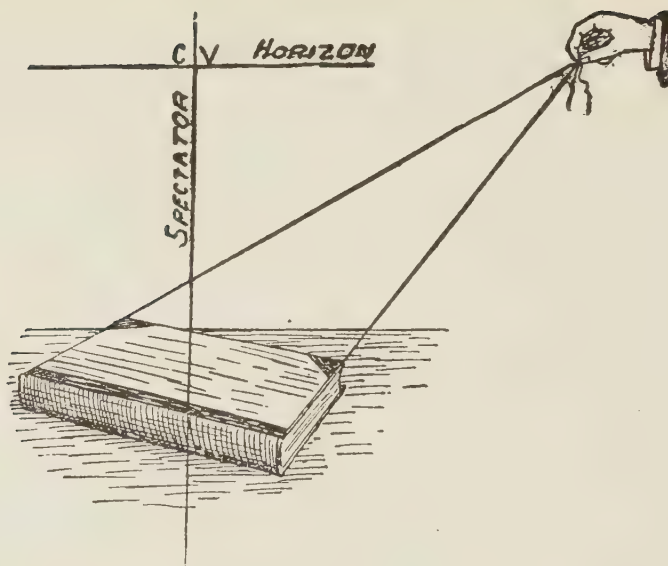


Fig. 219

Change the position of the book so that the edges recede towards the right and notice that the point of intersection is to the right of a point directly in front of the eye. (Fig. 219.)

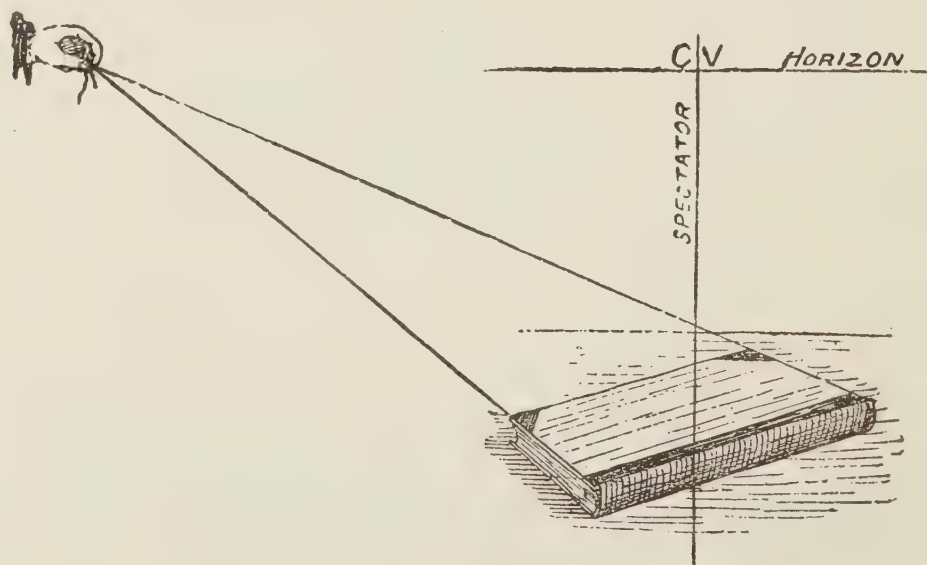


Fig. 220

Allow the edges of the book to recede towards the left. Where is the point of intersection now? (Fig. 220)

Third Principle: The converging or vanishing point for lines representing parallel edges will be:—

- (1) *In the horizon when the receding edges represented are horizontal.*
- (2) *Above the horizon when the edges represented recede upward.*
- (3) *Below the horizon when the edges represented recede downward.*
- (4) *To the right of the centre of vision when the edges represented recede towards the right of the spectator.*
- (5) *To the left of the centre of vision when the edges represented recede to the left of the spectator.*

Here again, do not rely entirely upon the principles just laid down. The eye and hand will be cultivated by exercise, and by trusting them confidence in their ability is increased. A knowledge of these principles will aid the eye to see and the hand to represent more accurately what is seen.

Draw the cube in different positions. Apply the principles of this section.

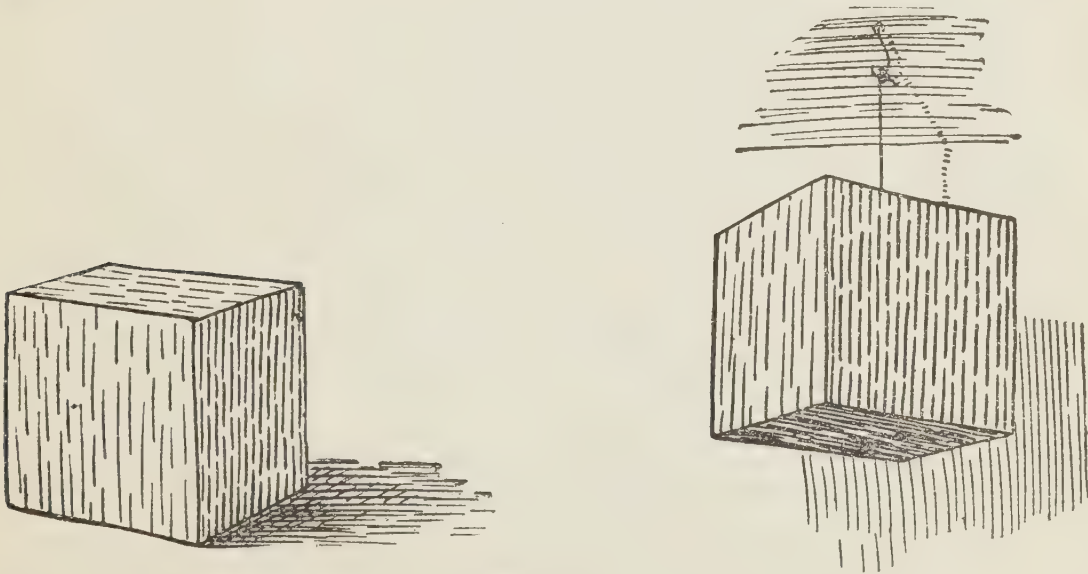


Fig. 221

It is not always convenient nor yet possible to show the vanishing point for converging lines and great care is necessary in representing receding

edges. It is well sometimes to produce the lines as far as the paper permits, as this will give a better opportunity to judge of their correctness. Under ordinary circumstances it is safe to assume that if a picture looks right the drawing is correct. (Fig. 222.)

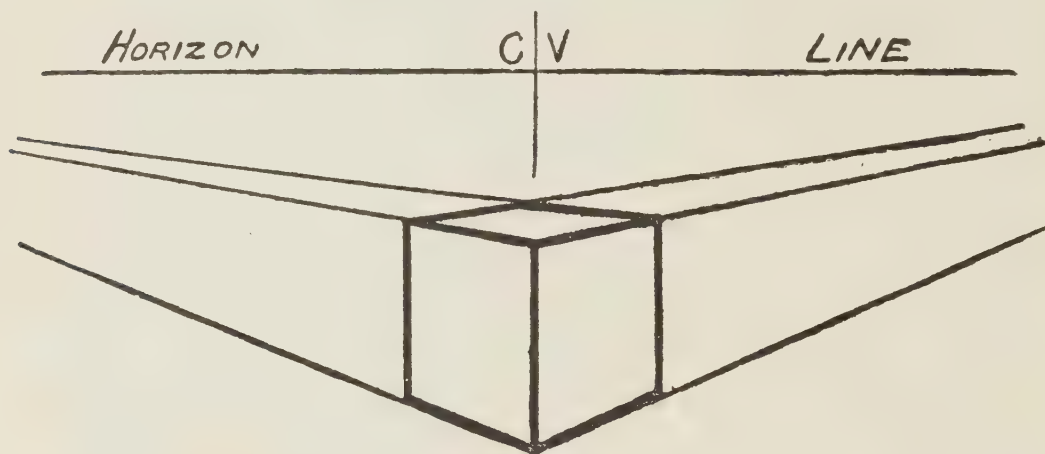


Fig. 222

Problems.

Draw the following objects according to the instructions given :—

1. A chalk box :—

- (a) Resting on the bottom ; position horizontal ; end, side and top visible.
- (b) Resting on the bottom ; horizontal ; end and side visible.
- (c) Resting on the bottom ; end visible.
- (d) Resting on one end ; cover removed ; horizontal ; end, side and part of the inside visible.
- (e) Nearer end resting on the ground ; farther end supported by a block ; end, side and part of the inside visible.
- (f) Farther end resting on the ground ; nearer end supported by a block ; end, side and part of the inside visible.

The plumb line is an excellent device to show the distance that one point appears to the right or left of another.

- (g) Farther end resting on the ground ; nearer end supported by a block ; end and part of the inside visible.
- (h) Suspended by a string ; end up ; lower end, side and part of the inside visible.



Fig. 223

2. A chair in five different positions. (Fig. 223.)
3. A cylinder lying on its curved surface.
4. A pen box in three positions.

The same experiments as outlined with the string may be performed successfully with a pane of glass as in *Parallel Perspective*,



Fig. 224

5. A funnel in five positions.
6. A stove-pipe elbow.
7. A school globe.
8. A washboard in five positions.
9. A trunk ; bottom, side and end visible.
10. A table in five positions. See fig. 224.



Fig. 225

11. Draw five objects found in the parlor, each in such a position that one edge recedes from the picture plane at an angle greater or less than a right angle. See fig. 225.

12. Sketch the outline of a pile of three planks, lying one across the other.

13. Draw a chair below the level of the eye so that a line connecting two of the legs does not recede at right angles to the picture plane.

14. Draw a box ; lid open at right angles to the top ; no faces parallel to the picture plane.

15. Draw a three-legged stool ; no edges parallel to the picture plane.

4. Shade and Shadow.

The suggestion of shade and shadow is possibly the most difficult department of drawing, yet the most powerful means of representing an object.

Shade is not a material substance, but merely an effect produced upon some part of an object because of its receiving less light than some other part. *This shaded part is always opposite to the light.* It is necessary to exercise great care, especially when drawing from memory and in grouping, in order that shaded parts are placed in proper position and properly graded. If the light falls from the left, shaded parts will be seen on the right and vice versa. Because shade is an effect produced on the object itself, it is really part of the object.

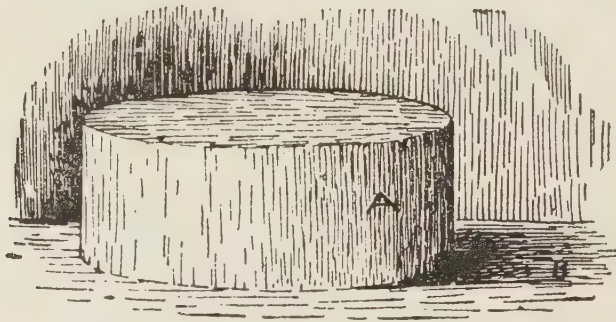


Fig. 226

Shadow is an effect produced in the same manner as shade. Shadow, however, differs from shade in that it is not a part of the object, but an effect produced outside of it because of the object intercepting the light. In fig. 226 the dark side of the cylinder is termed shade, the dark effect upon the ground, shadow.

The application of shade and shadow will aid in making the drawing of an object stand out from the background and from surrounding objects. This effect is called *relief* and is well illustrated in fig. 226.

It will aid, too, in giving prominence to any part of a picture. The house, for example, in fig. 227, attracts attention before the trees, the hills or the ship. *Emphasis* is given to the house.

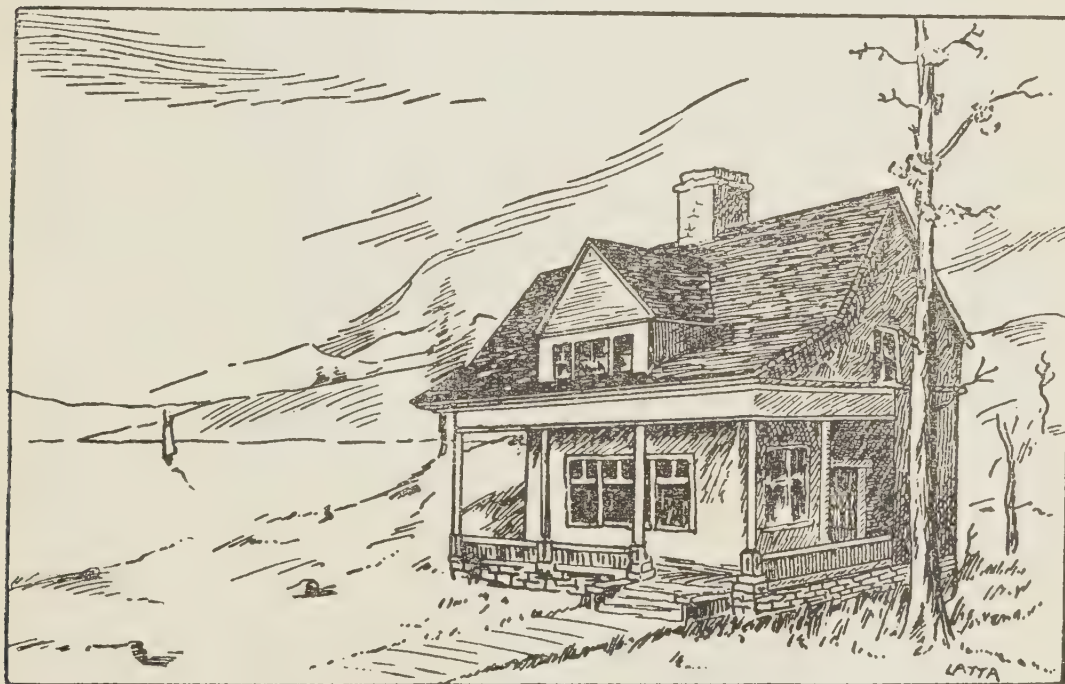


Fig. 227

Compare the drawings of the cylinder in fig. 228. A much better idea of the roundness of the object is given by B than A, although one is an exact tracing of the other. Shade and shadow here again aid in suggesting roundness or thickness. This is termed *solidity*.

That medium which requires the least attention is the best for a beginner. For outline drawing and sketching there is nothing better than the

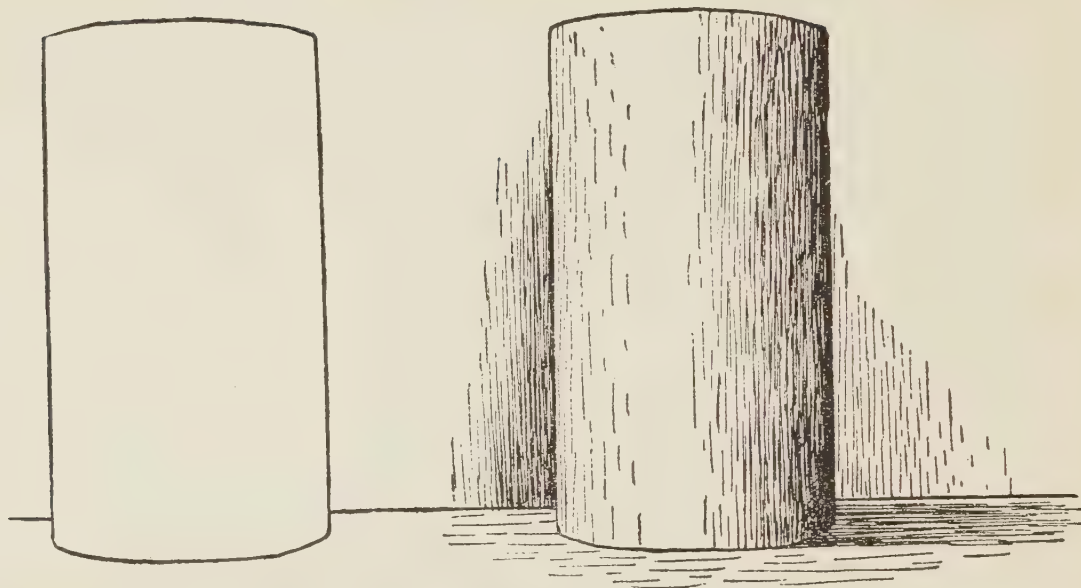


Fig. 228

pencil. For shaded work, too, the pencil has advantages over charcoal, brush or pen. These of course have their advantages, but the pencil is quite suitable for all ordinary purposes and requires comparatively no attention from the student, thus allowing all the energy to be directed to the object. With the pencil, too, any grade of drawing may be done, from that of simplest outline to the many gradations of shade and shadow in the most complicated subject. Pen and ink as a medium for drawing is one always obtainable. It has the advantage of compelling the utmost care on the part of the user, as well as developing a certain dexterity in the use of this particular medium, a very important matter when we consider how much it is used in the ordinary business of every-day life.

The methods that follow have been found to be the best when pencil or pen is used :—

1. *Crosshatching*: This is done by drawing quick, short lines across one another, grading the shade by (a) the number and (b) the blackness of the lines.

Exercises like the following should precede an attempt to make a shaded drawing.

Sketch a rectangle 6 in. by 1 in. Divide it into six equal squares. The white paper of the left square represents the lightest shade—the highest light. Draw quick, short parallel lines across the second square to represent a shade darker than that of the first. In the third draw two sets of similar lines crossing each other to represent a shade still darker. In the fourth square three sets, etc., until in the last a perfect black is obtained. Great care should be exercised to make a proportionate grade of shade from a very light to a very dark. The number, strength and closeness of the lines should be considered. (Fig. 229.)

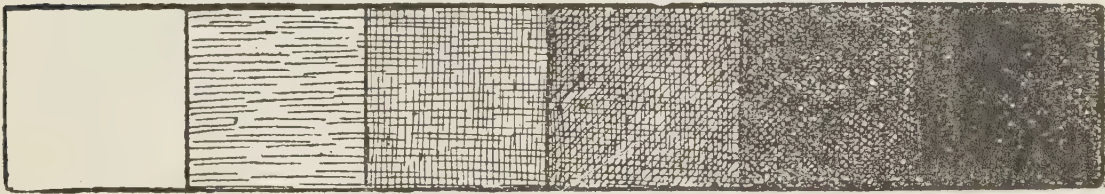


Fig. 229

2. *Parallel Lines*: By this method the lines are drawn in the same manner but all practically in the same direction.

Sketch a rectangle and divide it into squares as before. Allow the first to remain white. In the second, draw light horizontal or vertical lines some distance apart to represent a shade darker. In the third, increase the number of lines by drawing them closer together. Proceed in the same manner in the other squares, making each square proportionately darker, until in the last the darkest shade is represented. (Fig. 230.)

A very pretty effect is produced by using almost the same number of lines but representing the darker shades by darker lines as in fig. 231.

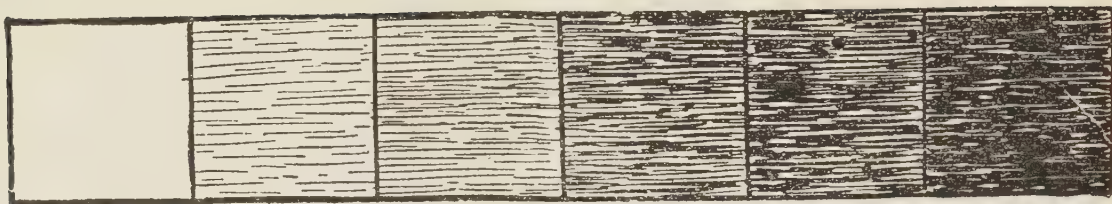


Fig. 230

A combination of these is a better method than either.

These methods are adapted to the use of pen or pencil, but more especially the pen. Even when the pencil is used, if the lines are drawn as in fig. 230 a richer shade is produced than by using the flat side. The white of the

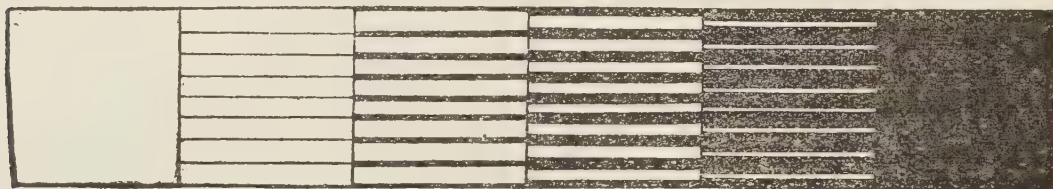


Fig. 231

paper as seen through the lines gives a cleaner, clear-cut appearance. The method that is best to use is largely determined by the object represented.

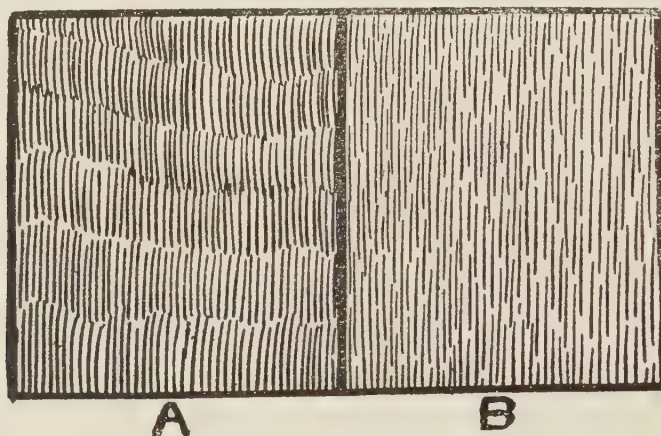


Fig. 232

Fig. 232 shows the proper method (B) and the wrong method (A) of laying on the lines, unless of course the object is to suggest a rough surface.

3. *Pencil*: By this method the side of the pencil is used, the gradation of shade being produced by pressure. The use of two or three differently graded pencils is a good plan. Use the hard for light and the soft for dark shades.

The stump is a very useful instrument in pencil shading. It is made of soft paper, tightly rolled and sandpapered to a point like a pencil. With it rub lightly over the pencil shading. In this manner the lines left by the pencil are well blended, producing a very pretty effect. Be careful in the use of the stump, as much less color is required. The amount of color left on it after rubbing heavy lines is often quite sufficient to produce the lighter shades.

Blending.

By this is meant a even gradation from the lightest to the darkest. There is no distinct line between the shades. Fig. 233 shows the different effects of crosshatching and parallel line shading.

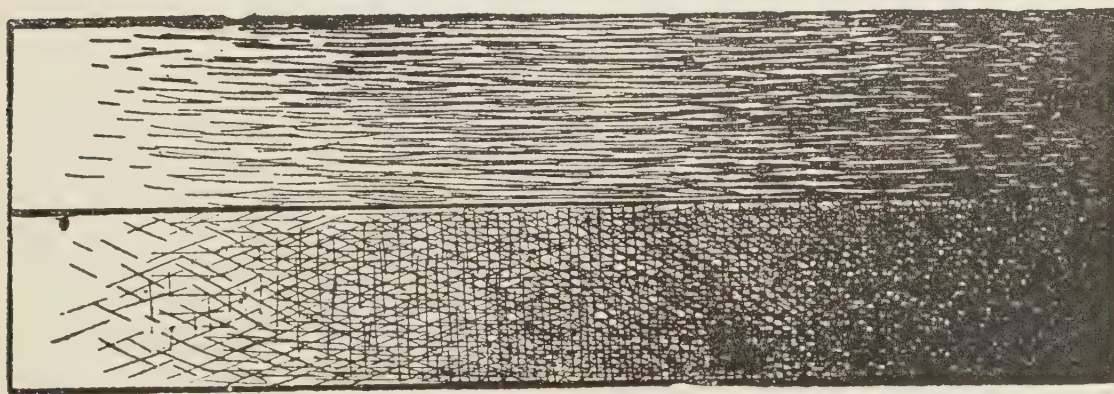


Fig. 233

Direction of Lines.

The direction of the line is a very important matter to be considered as a reference to fig. 234 will show. As a rule, when parallel lines are used,

vertical surfaces are shaded by vertical lines, horizontal surfaces by horizontal lines and oblique surfaces by oblique lines. Curved surfaces are often nicely shaded by curved lines. This, however, is not always necessary. There is one serious objection to the use of curved lines in representing a curved surface. It is this, that curved lines are very difficult to make uniform in strength and direction, a very necessary matter in suggesting a smooth surface.

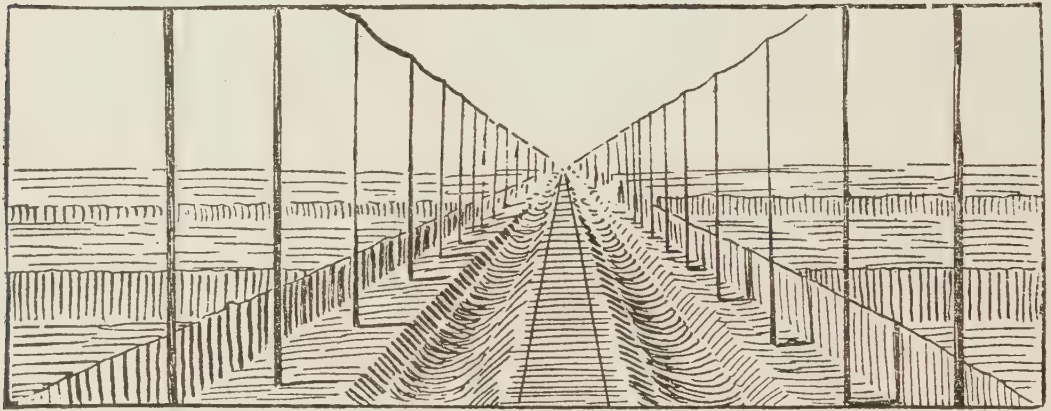


Fig. 234

Fig. 235 shows the method of applying crosshatching in representing the smooth, curved surface of a sphere. Many of the figures in *The Circular Tablet, Cylinder and Cone* illustrate parallel line shading as applied to curved surfaces.

The Model.

It is almost impossible in an ordinary school room to obtain the proper conditions of light to afford good examples to begin with. As a rule, there is no definite outline in nature and the more indefinite the shades and shadows are the more difficult it is to suggest them.

Use such objects under such conditions that the shades and shadows are as definite as possible. To obtain the best results observe the following directions :—

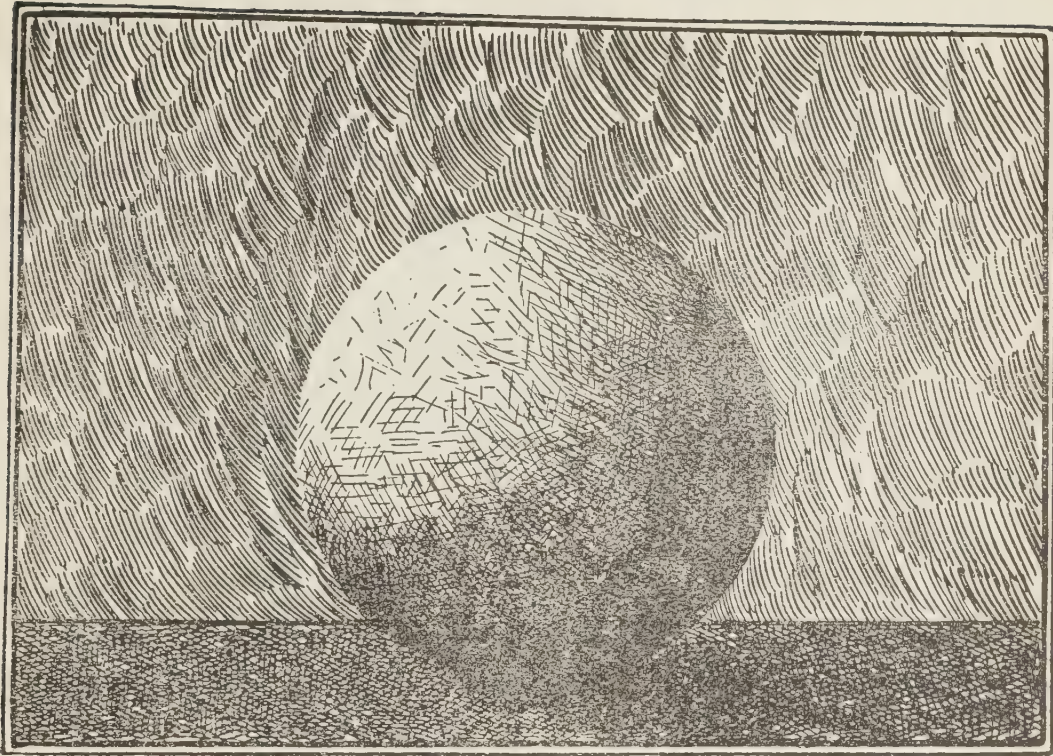


Fig. 235

Begin with a white cube made of plaster of Paris or white paper placed upon a white ground. Allow the light to enter the room from the left side only, slightly above and to the rear. Place the cube a few feet in front and below the eye level so that three faces are visible. Sketch the outline in the usual way. Examine the shades on each face carefully. It is not so necessary that the exact shade of each face should be represented as it is to give a *proportionate* value to each. The vertical face to the right is the darkest; the vertical face to the left the lightest, and the top, although lighter than the right side, is darker than the left. Represent the lightest shade first and grade each accordingly. See fig. 236.

Examine the shadow. It is darker nearer the cube. Sketch its outline. Observe in the shadow that its darkest part is slightly darker than the darkest side of the cube.

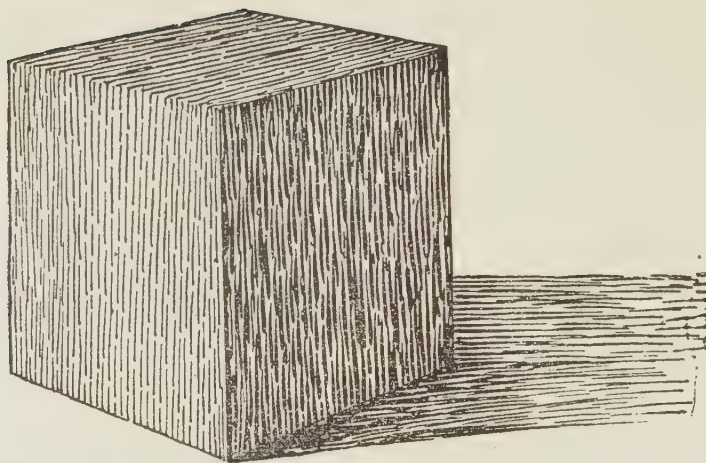


Fig. 236

Curved surfaces should be attempted after some ability has been attained in representing flat surfaces.

Problems.

1. Draw an ink bottle. Show shade and shadow. The light falls from the left.
2. Draw a book in three positions :—
 - (a) Light from the right.
 - (b) Light from the left.
 - (c) Open ; some of the leaves vertical ; light from the left.
3. A piece of two-inch plank about 3 ft. long and a foot wide stands on the ground, directly in front and below the eye, the two-inch face towards you. Outline the plank and represent shade and shadow. The light falls from the left.
4. Draw a group of three apples ; light from the right.
5. Sketch the outline of an ordinary straw hat, shade it and show the shadow. The light falls from the right and above.

5. Grouping.

Grouping is the drawing of more than one object in a picture. Attractive groups show *Unity*, *Harmony*, *Variety* and *Repose*.

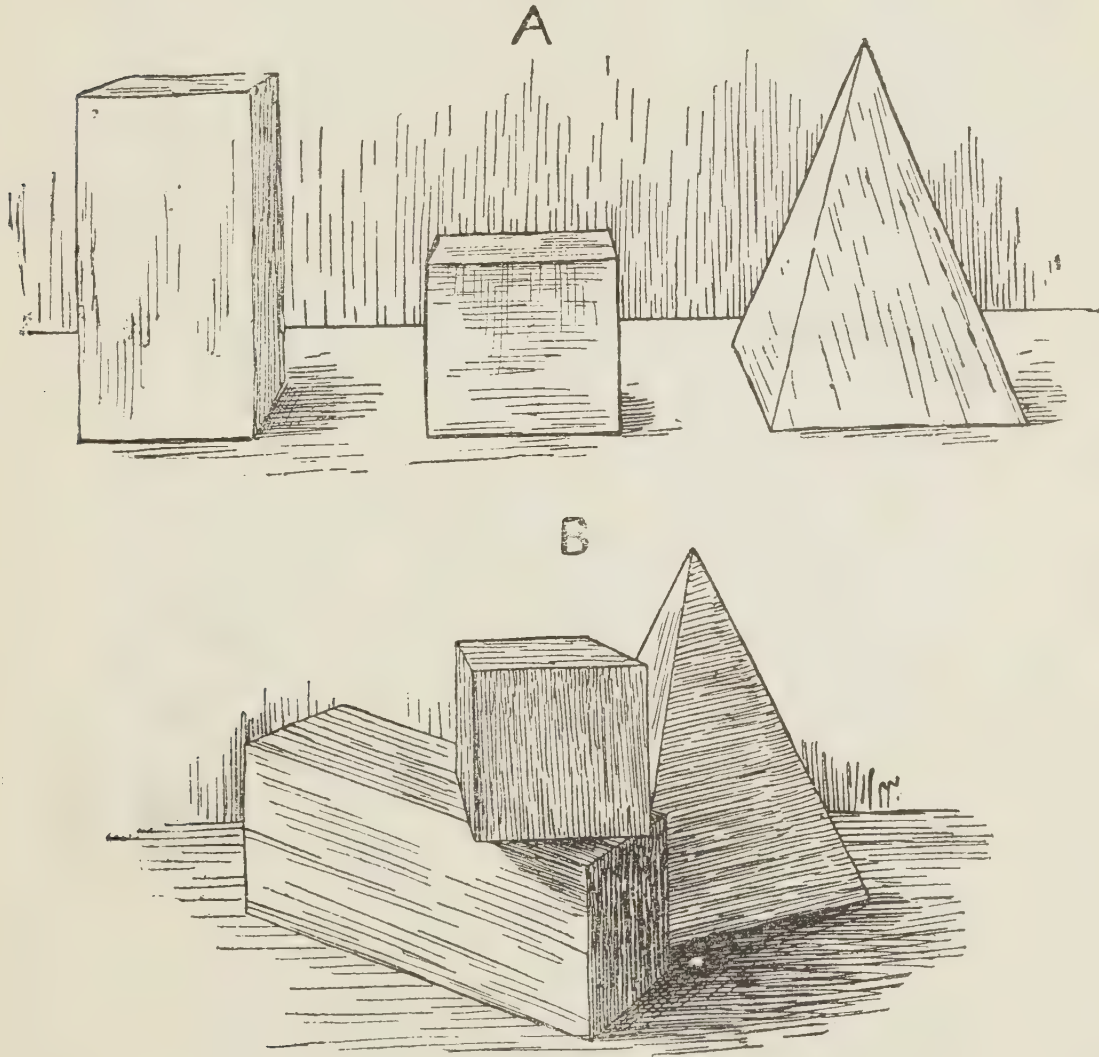


Fig. 237

Unity is obtained by placing the units of a picture in such a manner as to form a connected whole. Give much attention to arrangement. Make

one picture and not a number of pictures closely placed together. Compare A and B of fig. 237.



Fig. 238

Harmony is the result of making the group pleasing by observing the character of the objects and their artistic arrangement. Select those objects having something in common and so arrange them that the whole may have a pleasant appearance. The geese, the barrow and the gardener, seen in the rear of a large residence, produce a harmonizing picture. (Fig. 238.)

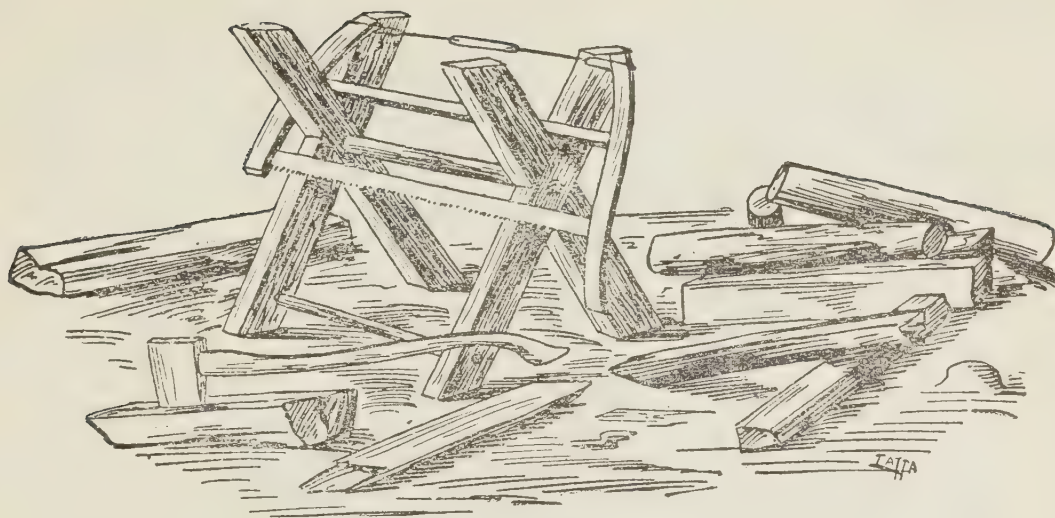


Fig. 239

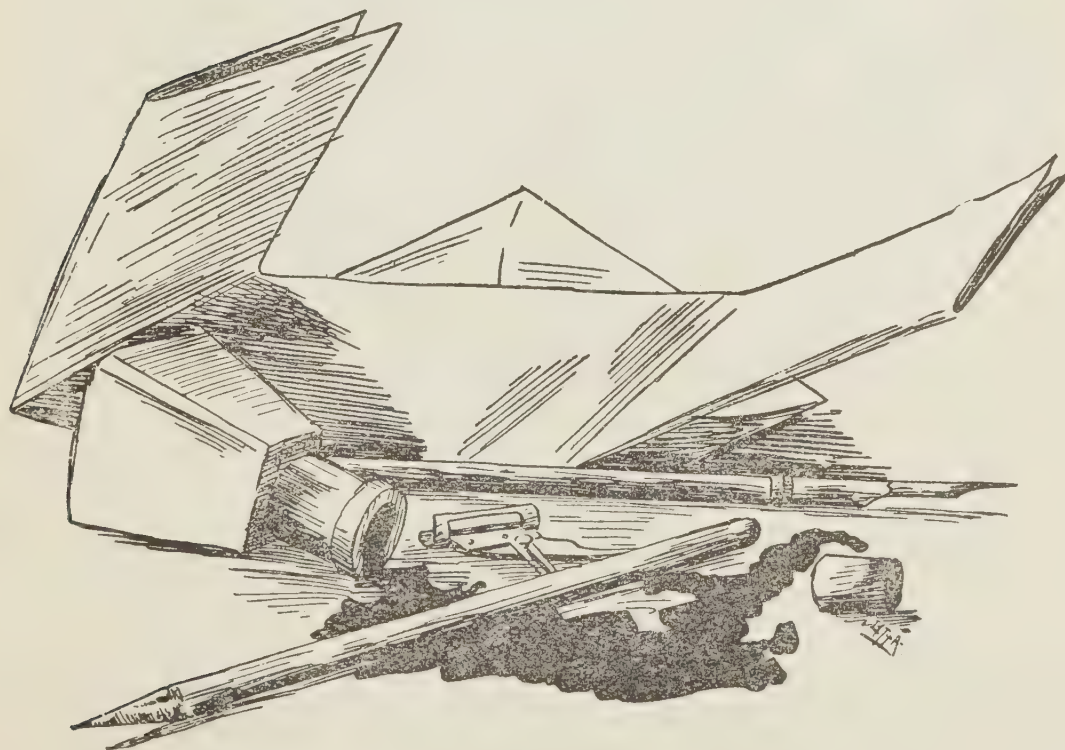


Fig. 240

Variety is obtained by grouping such objects that are unlike each other in shape, size or quality. Be careful that a desire to produce variety does not destroy the harmony. Similar objects should be placed in different positions or so that they are partly hidden. Slightly emphasizing parts will also add variety. (Fig. 240.)



Fig. 241

Repose gives a feeling of rest to the eye. So arrange the parts that each will appear to be perfectly at rest. Shadows will aid in this respect. (Fig. 241.)

The same general directions previously given for drawing single objects apply to the drawing of groups. Conceive of the group first as a whole and proceed to build it up by placing the parts together.

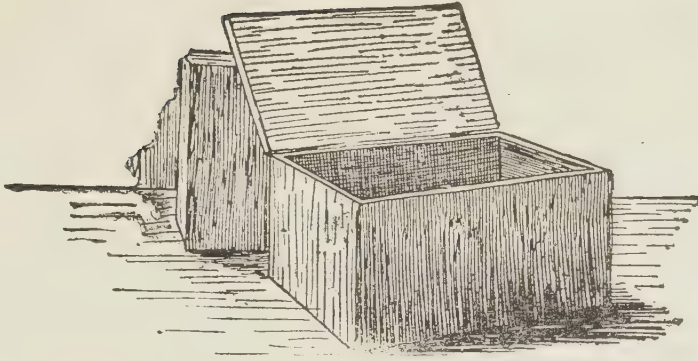


Fig. 242

First endeavor to see only the general outline of the whole group. Lose sight, in fact, of all points of detail. Think of the group as the silhouette shown in fig. 243.

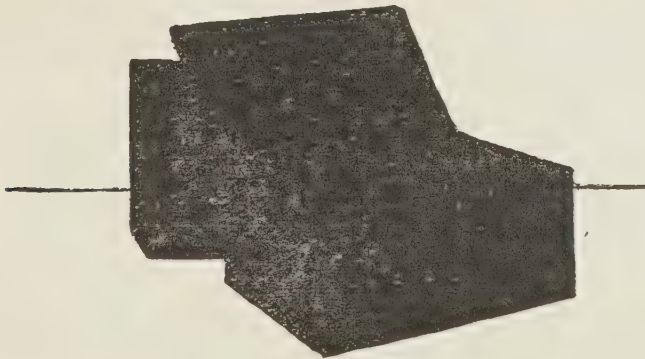


Fig. 243

Sketch the outline similar to fig. 244. After proportions of the whole are satisfactorily arranged, fill in the detail as in fig. 245.

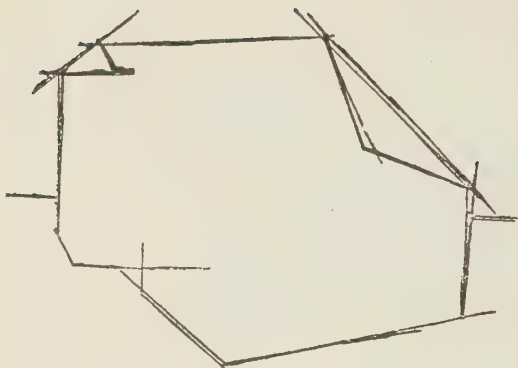


Fig. 244

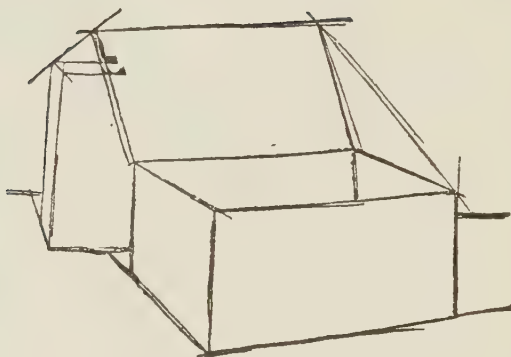


Fig. 245

The brief hints given in this section must not be regarded as arbitrary, as it is impossible to lay down any hard and fast rules. Let every picture tell its own story. This story, of course, will depend largely upon the mood and temperment of the composer, and even then interpretation by different persons may be entirely different. To some fig. 239 suggests but little, but there are others to whom it tells a long, long story.

In addition, strive to obtain :—

1. Variety of lines both in character and direction.
2. A light, free touch of pen or pencil.
3. Pleasing and suggestive positions of the units composing a group.

At the same time avoid :—

1. Long unbroken lines.
2. Undue emphasizing of lines.
3. Lines which are heavy and cumbersome.
4. The employment of more lines than are absolutely necessary.

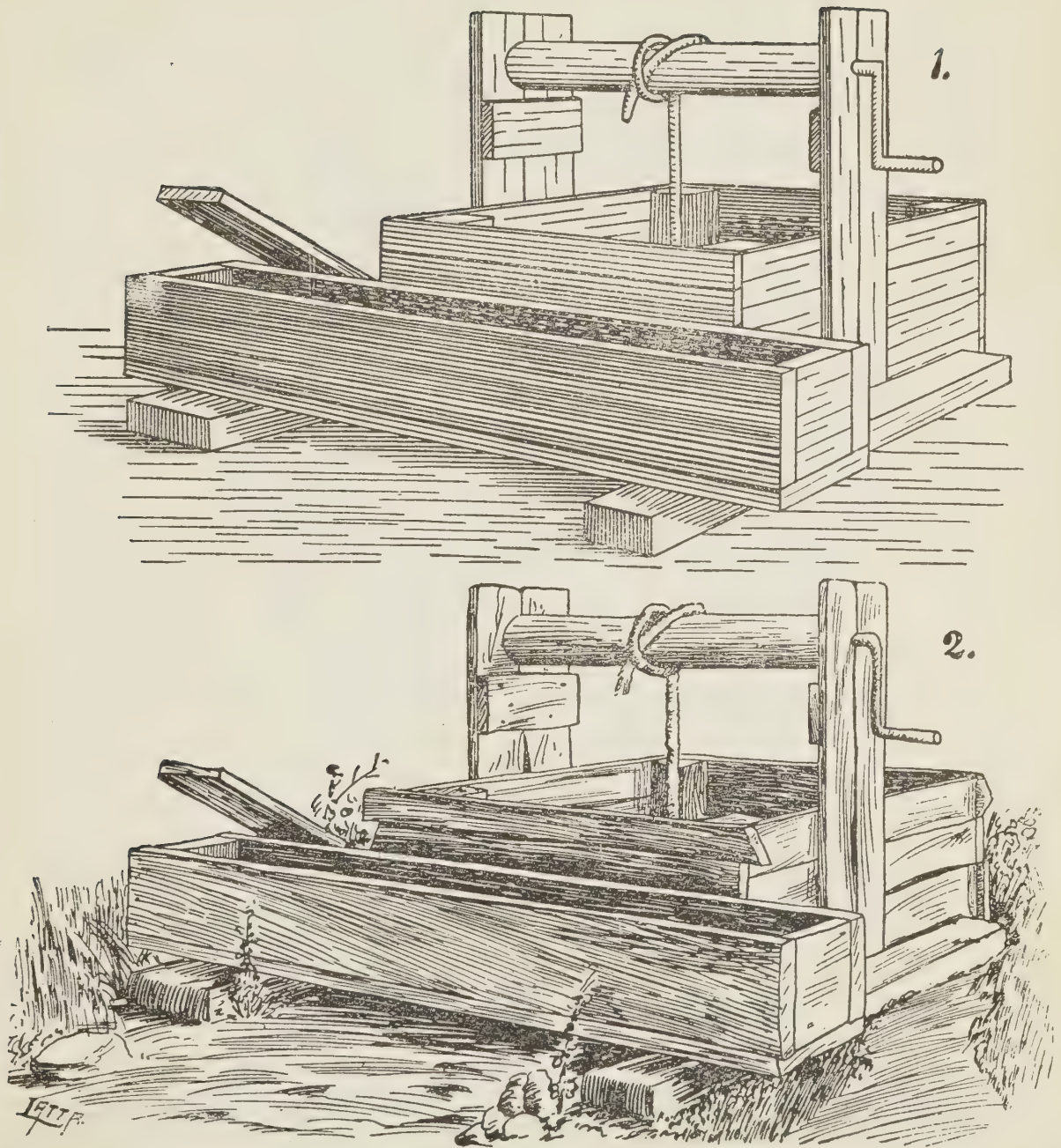


Fig. 246

5. The use of mechanical means in drawing lines. It is often desirable to break up a hard and mechanical outline. Examine the illustrations of the old well on page 233.

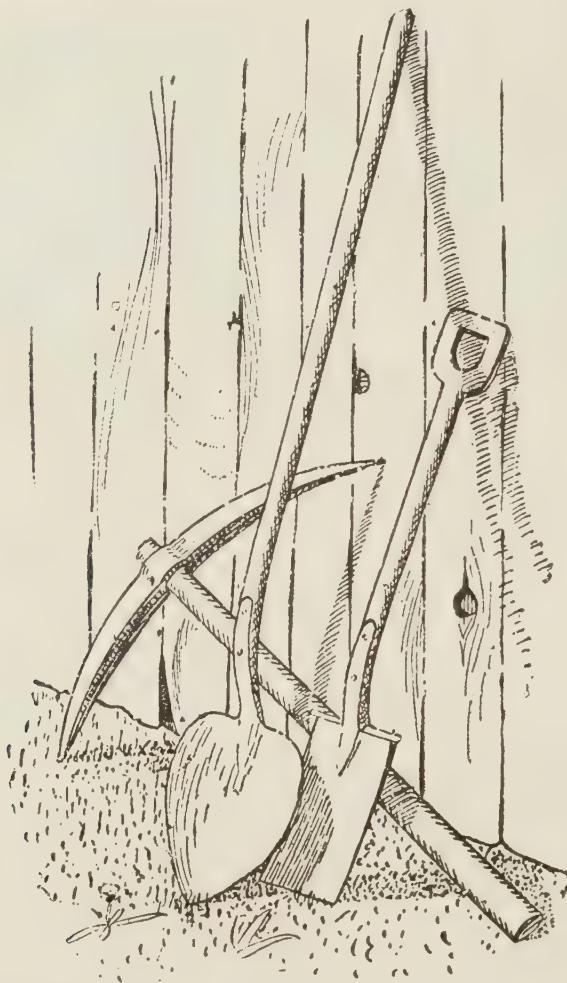


Fig. 247

The outline sketches on page 235 will suggest a number of groups. Procure such objects as are given and group them. Make the drawings in the usual way.



Fig. 248

Problems.

Draw groups of the following :—

1. A camera, case and tripod to suggest that the owner was examining his kit previous to a trip into the country. (Fig. 186.)

2. Pail, broom and mop.
3. Axe and block of wood.
4. Cube, sphere and cylinder.
5. Rake, hoe and shovel.
6. Opera glasses and case.
7. Knife, pencil and scribbler.
8. Hat and coat.
9. Boots and rubbers.
10. Chair and table.
11. Lamp and books.
12. Cup, saucer and teapot.
13. Pump, fence and water-trough.
14. Hand-sleigh and wood pile.
15. Globe and chalk box.
16. Bat, ball and lacrosse stick.
17. Rocking chair, table and lamp.
18. Knife, fork and plate.
19. Mucilage bottle and brush.
20. Glass, bottle and spoon.

6. Position of the Picture Plane.

What may be termed the focal capacity of the eye is, on an average, about 60 degrees ; that is, we are able to see at one time all objects within two lines drawn from the eye at an angle of 60° to each other, 30° on each side of the line representing the direction in which we are looking—the line of sight.

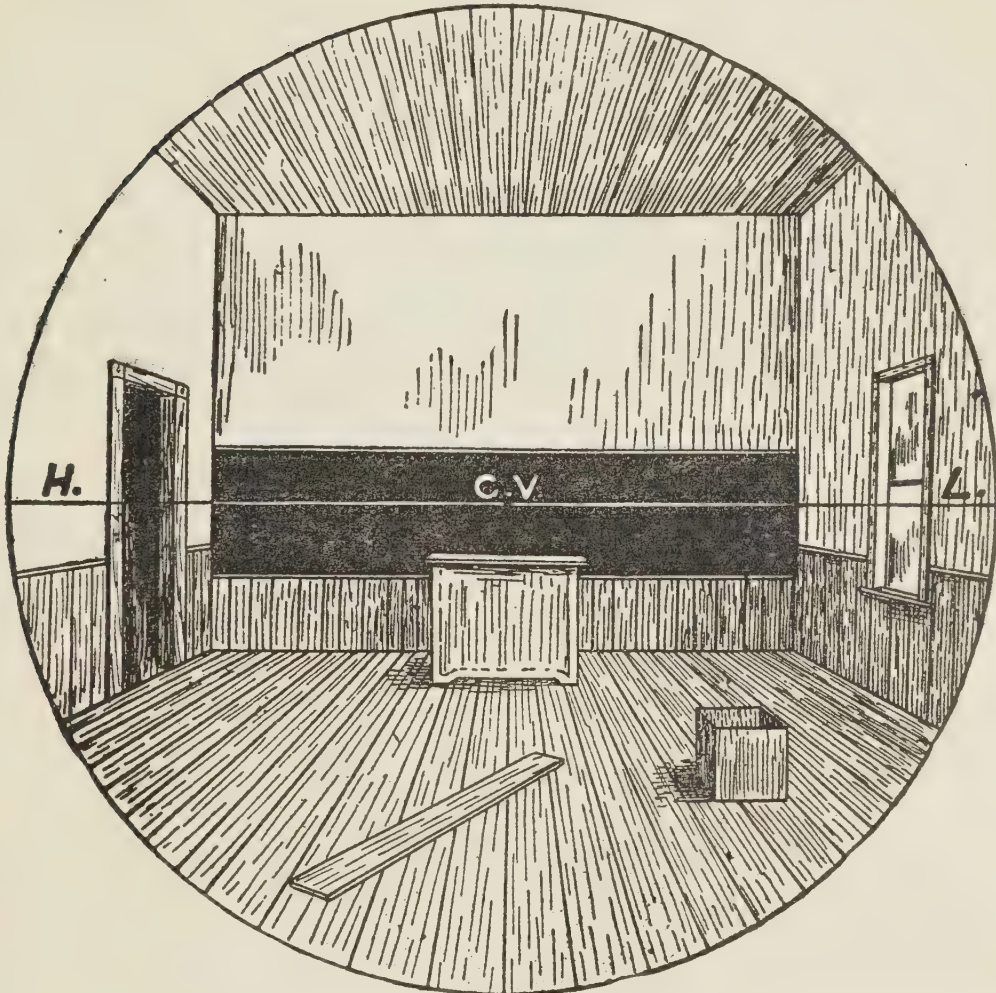


Fig. 249

Fig. 249 represents the part of a room that may be seen without changing the position of the eye. If the distance between the eye and the black-board were lessened, less of the room would be visible, and vice versa. The farther away a group of objects is, the more of the group is visible, unless, of course, the distance be so great as to cause it to be indistinct.

The whole view visible at one time is in the form of a circle of such a size that, if lines were drawn from two opposite points on the circumference

to the eye, they would form an angle of 60° . The centre of vision is the centre of this circle and the horizon passes through this centre, so that in reality, every time the position of the eye changes, a new picture is presented to the mind. There is a new C. V. and a new horizon.

This focal capacity of the eye often necessitates many changes of position in getting a view of even one object. This is especially the case when viewing a large object like a building, or when viewing an object close to the eye. A person in reading a newspaper is able to see a small portion of it at one time. The position of his eyes must be changed frequently before all has been seen.

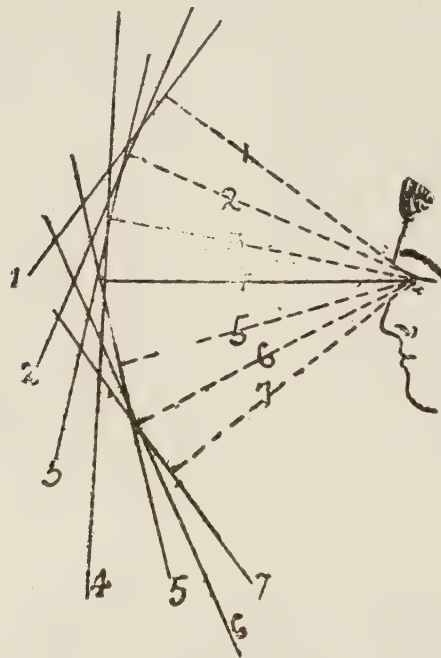


Fig. 250

In fig. 250 the dotted lines represent the different lines of sight at different positions of the eye. It is quite necessary to move the eye in this

manner to get a view of many objects. Our impressions of an object, then, are often the result of many pictures being presented to the mind at different times. True, the time intervening between the presentations is very short, so short that the view is taken in almost at a glance.

The picture plane is always perpendicular to the line of sight. There is, therefore, a new plane every time the eye changes its position. It is clear that if all these planes are combined to form one plane, it would be the shape of the inside covering of a sphere.

The natural position of the body is vertical and the muscles of the eye are in their easiest position when the line of sight is horizontal. A photographer, in setting his camera, is careful to place it in this position. Pictures are hung upon the wall, when above the eye, in such a position that they appear as they would if vertical when on a level with the eye. In memory drawing, it is safe to be guided by principles governing the representation of objects as they would appear on a vertical plane.

Cubical objects, represented as the box seen upon the floor in fig. 249, are, strictly speaking, a part of another larger picture. This is true of almost every drawing.

The best view of an object, however, is obtained when it is at or near the centre of vision, and, as before intimated, care must be exercised to guard against placing it so far from the C. V. as to cause distortion. This is often noticed in a photograph where the focal capacity of the lense has been insufficient to cover the whole plate properly.

7. The Human Figure.

We fully recognize the fact that efficiency in drawing the human figure cannot be attained without a long course of hard study. Our object, however, in introducing the subject here, is not to outline a course of this kind, but to merely suggest another means of excellent and interesting practice which will tend to cultivate the power to see and to express what is seen.



Fig. 251

Begin by drawing different articles of clothing in different positions. Hang a coat, for example, on the wall a few feet in front. A dark coat

against a light background or a light coat against a dark background is the best. Sketch the outline. (Fig. 251.)

Try at first to use as few lines as are necessary to suggest the outline and folds of the cloth. Avoid the too common error of scratching down lines promiscuously without regard to their significance. Every line should mean something. Do not draw a line until satisfied that it is required to make the drawing more suggestive. Notice the very few lines used in fig. 254.



Fig. 252

The face is more easily outlined in profile, although it is more difficult to give expression in this position. In first attempts, do not be discouraged



Fig. 253

if a likeness is not obtained, but be quite content with getting fair proportions in general. See drawings on page 247.

Study carefully the construction of the hand, (fig. 252). Compare length with width, length of fingers with each other and with the whole hand. Notice the number and length of joints, etc. Draw the left hand in different positions. Such exercises as this will aid in the expression of the whole figure, although the detail of the hands may not be shown. (Fig. 253.)



Fig. 254



Fig. 255



Fig. 256

Study the feet in the same manner. Good practice may be obtained by drawing a pair of boots in different positions.

When posing a model for a first attempt, it is best to have the face shown in profile and the arms so arranged that the hands are not fully visible. See fig. 254.

The three outlines shown on page 247 illustrate the method of making a quick sketch. No. 3 is after a character sketch by that well-known pen-and-ink artist, Phil. May. Although such drawings as these are apparently made quite freely, a great deal of care is necessary in their production.

The space at our disposal will not allow but few drawings of the human figure. The few presented will give some idea of the methods that may be employed. Our object is attained by merely suggesting it as a model for practice.

Problems.

1. Draw your left hand.
2. Make an outline sketch of your left foot as it appears when extended in front.
3. A lady is sitting by a table upon which lies a book that she is reading. Make a drawing of the lady, chair, book and that part of the table supporting the book.
4. Make an outline sketch of a little girl ; face towards you ; arms folded.
5. Copy the drawings shown on pages 244-5-8-9.
6. Draw a lady's head showing the arrangement of the hair, (1) back view ; (2) side view.
7. A boy sits in a rocking chair, reading the newspaper. Make a drawing showing a side view of the group.
8. Draw from memory, the right hand holding a pencil.
9. A little girl is writing a letter to her grandma. Illustrate by a drawing.
10. Make an outline sketch of a boy standing in a position to catch a ball.
11. Two boys are standing by a large box, talking. Draw the group.



Fig. 257

12. Copy any good picture of Queen Victoria, Lord Roberts or Mr. Gladstone.



Fig. 258



Fig. 259

13. Little Will and his large Newfoundland dog are having their picture taken. Show by a drawing what the group would look like.

14. Sketch an oval about 4 inches long. Inside the oval sketch the Queen's head. Show two Union Jacks, one draped on either side.

15. Copy outline sketches of Sir Wilfrid Laurier and Sir John Macdonald.

In letting this little book pass from our hands, we desire to express the great pleasure we have enjoyed in preparing it.

The work will fall short of its purpose if it does not lead the teacher, into whose hands it may fall, to allow the activities of children the greatest freedom even to the extent of encouraging, under his judicious guidance, their flights of fancy in a humorous direction.

During the progress of the work we have had as our constant companions—in imagination—the bright and pleased faces of thousands of the children of the public schools, to whom we hope, through its pages, soon to speak in reality. In so far as we have been enabled to interpret their difficulties, we have endeavored to suggest a means to surmount them. We believe that a training along the lines herein suggested will be a means of removing many of the clouds, lightening many of the burdens and doing away with much of the drudgery that too often accompanies the student's work in this otherwise fascinating subject.



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